5-2410-229-12

TM 5-2410-229-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR

AND

ORGANIZATIONAL

MAINTENANCE MANUAL

TRACTOR, FULL TRACKED

DIESEL DRIVEN, AIR DROPPABLE

(CATERPILLAR MODEL D6B)

FSN 2410-926-0910

This copy is a reprint which includes current pages from Changes 2,4 & 5

HEADQUARTERS, DEPARTMENT OF THE ARMY
APRIL 1968

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READEX MICRO best copy available

SAFETY PRECAUTIONS

Before Operation

Always be sure that adequate supports are placed under the bulldozer blade, and tractor before performing any lubrication or maintenance requirements to tracks, blade, or underneath the tractor.

Remove excess lubricant deposits from hand grips, steps, and lever handles after performing lubrication and maintenance requirements.

Do not smoke or permit an open flame near batteries or fuel tanks when performing any maintenance requirements. Provide a metal-to-metal contact when adding fuel to tanks.

Always be sure the brake lock is locked with the right steering clutch brake pedal; the flywheel clutch lever is pushed forward; and the gear selector and forward and reverse levers are in neutral position before starting.

Do not operate the engine in a closed building unless exhaust gases are piped outside.

During Operation

Be sure that all personnel have been cleared from operating area before putting the tractor in motion.

Do not get on or off a moving tractor.

Do not adjust cable control when engine is running, because clutch engagement is necessary when adjusting the clutch.

Do not attempt cable replacement with engine running.

Clear the personnel away from area of cable when cable is in use.

Always lock brake lock control when getting off temporarily stopped tractor.

Do not attempt to clean, oil, or adjust tractor while it is in motion.

When using a fire extinguisher, avoid inhaling fumes and smoke.

After Operation

Always be sure the lock brake controls are locked and all control levers are in neutral position.

Always be sure adequate supports are placed under bulldozer blade, and tractor before performing any lubrication or maintenance to tracks, blade, or underneath the tractor.

Remove excess lubricant deposits from hand grips, steps, and lever handles after performing lubrication and maintenance requirements.

Do not smoke or permit an open flame near batteries or fuel tanks when performing any maintenance requirements. Provide a metal-to-metal contact when adding fuel to tanks.

When using fire extinguisher, avoid inhaling fumes and smoke.

Wash the steering clutch brakes when the steering clutch compartments are cool and well ventilated to avoid the possibility of an explosion.

TM 5-2410-229-12
C 2

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *17 July 1969*

Operator and Organizational Maintenance Manual
TRACTOR, FULL TRACKED, DIESEL DRIVEN
AIR-DROPPABLE (CATERPILLAR MODEL D6B)
FSN 2410-926-0910

TM 5-2410-229-12, 5 April 1968, is changed as follows:

Page B-1. Appendix B is superseded as follows:

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III. (Not applicable).

d. Section IV. (Not applicable).

B-2. Explanation of Columns in Section II

a. Group Number, Column (1). The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC (Maintenance Allocation Chart) in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group, Column (2). This column contains a brief description of the components of each assembly group.

c. Maintenance Functions, Column (3). This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

The maintenance functions are defined as follows:

A—Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B—Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C—Service. To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D—Adjust. To rectify to the extent necessary to bring into proper operating range.

E—Aline. To adjust specified variable elements of an item to bring to optimum performance.

F—Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G—Install. To set up for use in an operational environment such as an emplacement, site, or vehicle.

H—Replace. To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I—Repair. To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

J—Overhaul. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K—Rebuild. To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment, Column (*4*). This column is provided for referencing by code the special tools and test equipment (sec. III) required to perform the maintenance functions (sec. II).

e. Remarks, Column (*5*). This column is provided for referencing by the code the remarks (sec. IV) pertinent to the maintenance functions.

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
01	DOZER BLADE ASSEMBLY								O	O				
	Cutting edge, end bits	C							O					
02	PUSH ARM AND BRACE ASSEMBLIES								O	O				
03	SHEAVE ASSEMBLY	C		C					O	O				
	Bearing, shaft								O	O				
	Cable	C							O	O				
04	SHEAVE HITCH								O	O				
05	SHEAVE BRACKET								O	O				
06	CABLE DRUM CONTROLS													
	Band, brake	C			C				O	F				
07	CABLE DRUM													
	Breather	C							O					
	Bearings, seals, gaskets	O							F					
	Gears, pinion, disc	F							F					
08	BLADE CONTROLS AND RADIATOR GUARD													
	Rod assembly								O	O				
	Levers, joints, shaft	C							O	O				
	Radiator guard								O	O				
09	UNIVERSAL JOINT ASSEMBLY													
	Spider and bearing assembly	O							O	O				

Section II. MAINTENANCE ALLOCATION CHART—Continued

(1) Group No.	(2) Functional group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
10	TRUNNION GROUP													
	Trunnion assembly	O							O					
11	LIGHTING SYSTEM GROUP													
	Switch	C							O					
	Lamp assembly	C							O					
	Sealed unit	C							O					
	Wire assembly	O							O	O				
12	OIL GAGE AND HEAT INDICATOR GROUP													
	Gage, pressure	C							O					
	Indicator, heat	C							O					
	Fittings, tubes	C							O					
13	FUEL PUMP AND GOVERNOR CONTROL GROUP													
	Levers, shafts and rods	C							O					
14	HOOD AND DASH													
	Dash assembly	C							O	O				
	Hood assembly	C							O	O				
15	BATTERY AND WIRING													
	Switches, cables	C							O					
	Battery	C	O	C					C					
	Regulator, voltage	C			O				O					

TM 9-2320-209-20P

16	SEAT CUSHIONS																	
	Cushion assemblies	C								O								
	Support assembly									O	O							
17	FUEL TANK AND BATTERY BOX																	
	Tank and box assembly	C		C						O	F							
	Tubes, fittings, valve	C								O	O							
18	RIFLE MOUNTING GROUP																	
	Bracket assemblies	C								O								
19	FENDERS AND FLOOR PLATES																	
	Plate and support assemblies	C								O	O							
	Fender and support assemblies	C								O	O							
20	RADIATOR GUARD																	
	Guard and brackets	C								F	O							
21	RADIATOR, FAN GUARD, AND HOSE																	
	Cap, gaskets	C								O								
	Elbow, pipe and hose	C								O	O							
	Tanks and core	C								F	F							
	Guard, baffle	C								F	O							
22	BELT TIGHTENER																	
	Pulley, bearings and seals	C								O	O							
23	SUCTION FAN GROUP																	
	Spider assembly	C								F	F							
24	CRANKCASE BREATHER																	
	Breather assembly	C		C						O								
	Element and gasket	C								O								
25	AIR CLEANER																	
	Element	C		C						C								
	Indicator	C								C								
26	EXHAUST MANIFOLD																	
	Manifold and gaskets	C								O	O							

Section II. MAINTENANCE ALLOCATION CHART—Continued

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
27	STARTING MOTOR													
	Motor			C					O	F				
	Switch, solenoid	C							O					
28	GENERATOR													
	Generator			C					O	F				
	Brush	O							O					
	Belt set	C			C				O					
29	FUEL INJECTOR AND LINES													
	Valve	O							F					
	Lines, fittings	C							F	O				
30	GOVERNOR GROUP													
	Governor				O				F	F				
31	PRIMING GROUP													
	Pump								O	F				
	Tubes, fittings	C							O	O				
32	FUEL TRANSFER PUMP GROUP													
	Element, gasket			C					O					
	Pump								O	F				
33	FUEL INJECTION PUMP GROUP													
	Pump	O							F	F				

34	FUEL FILTER																		
	Element	C								O									
	Gage, pressure	C								O									
35	OIL COOLER																		
	Cooler	O								F									
	Tubes, elbows	C								F									
36	OIL FILTER GROUP																		
	Oil filter			C						O									
37	GLOW PLUG AND WIRING																		
	Glow plug	C								O									
38	SERVICE METER GROUP																		
	Service meter	C								O	O								
39	ACCESSORY DRIVE																		
	Gears, shaft	O								F									
	Bearings	O								F									
40	UNIVERSAL JOINT ASSEMBLY																		
	Joint assembly	C								O	O								
	Spider and bearing									O	O								
41	GEARSHIFT AND CLUTCH CONTROLS																		
	Housing, levers, bearings	C								H	H								
	Seals, shafts	O								H	H								
	Fittings, lubrication	O								O									
	Handle, knobs	C								O									
42	GEARSHIFT AND CLUTCH LINKAGE																		
	Forks, levers	C								H									
	Rods, springs, shafts	O								H									
43	FLYWHEEL CLUTCH COVER AND OIL PUMP																		
	Breather, oil level plunger	C								O									
	Pump	O								F	H								
	Shoe assembly, brake									H	H								

Section II. MAINTENANCE ALLOCATION CHART—Continued

(1) Group No.	(2) Functional group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
44	CLUTCH YOKE, COLLAR AND BEARINGS													
	Shaft, bearings								H	H				
	Yoke, seals								H	H				
45	CLUTCH PLATES AND DISC													
	Plate, disc, springs								H	H				
46	WATER PUMP													
	Pump	C		C					F	H				
	Fittings, lubrication	C							O					
47	ENGINE, CYLINDER HEAD													
	Engine	C	F	C					H	F	H			
	Head								F	F				
	Cover, rocker arm								O	O				
	Thermostat	C	O						O					
48	CYLINDER BLOCK													
	Covers, oil pan								F	F				
	Pipe, cover, breather			O					O	O				
	Cylinder liner								H	H				
	Camshaft bearings								H	H				
49	OIL PUMP													
	Pump assembly								F	H				

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Section II. MAINTENANCE ALLOCATION CHART—Continued

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
63	STEERING CLUTCH CONTROLS													
	Levers, clevis, shafts	C							O	O				
	Yoke								F	F				
64	HYDRAULIC CONTROLS AND HOUSING													
	Strainer, screen assembly	C							O					
	Piston, valve, cylinder								F	F				
65	STEERING CLUTCH OIL PUMP GROUP													
	Oil pump group								F	F				
66	STEERING CLUTCH													
	Disc, plates								F	F				
67	STEERING BRAKE CONTROLS													
	Anchor								F	F				
	Pedal, spring, rods								O	O				
68	STEERING BRAKE BAND													
	Band assembly	O			O				F	F				
69	FINAL DRIVE													
	Sprocket assembly								H	H				
	Gears, seals, bearings								H	H				
70	FINAL DRIVE DRUM AND FLANGE													
	Drum, gear, bearings								H	H				

71	TRANSMISSION CASE AND FRAME								H	H					
	Case and frame assembly								F	F					
	Covers														
72	TRANSMISSION CASE COVERS								F	F					
	Cover assemblies								O	O					
	Plunger assembly, oil lever														
73	EQUALIZER SPRING								F	F					
	Spring								O	O					
	Tube, fittings														
74	TRACK CARRIER ROLLER								F	F					
	Track carrier roller group														
75	TRACK ROLLER GROUP								F	F					
	Track roller group														
76	TRACK ROLLER FRAME								H	H					
	Frame assembly														
77	FIRE EXTINGUISHER GROUP	C		O					C						

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:
To be distributed in accordance with DA Form 12-25, Section II, (qty rqr block No. 478) organizational maintenance requirements for Tractors, Tracked, Medium.

Changes in force: C 2, C 3, and C 4

TM 5-2410-229-12
*C 4

Change No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *20 April 1973*

Operator and Organizational Maintenance Manual

TRACTOR, FULL TRACKED DIESEL DRIVEN, AIR DROPPABLE (CATERPILLAR MODEL D6B) FSN 2410-926-0910

TM 5-2410-229-12, 5 April 1968, is changed as follows:

Page 4. The following is added:

"SCOPE

This manual is for your use in operating and maintaining the Caterpillar Model D6B Tractor. You can improve this manual by calling attention to errors and by recommending improvements, using DA Form 2028 (Recommended Changes to Publications), or by a letter, and mail direct to Commander, US Army Mobility Equipment Command, ATTN: AMSME-MP, 4300 Goodfellow Boulevard, St. Louis, MO 63120. A reply will be furnished directly to you. Maintenance forms and records that you are required to use are explained in TM 38-750."

Page 6. Add the following: "Refer to table 1 for a list of maintenance and operating supplies used with this equipment.

*This change supersedes C 1, 23 May 1969.

504-084—73

Table 1. Maintenance and Operating Supplies

(1) Component Application	(2) Federal Stock Number	(3) Description	(4) Quantity Required F/Initial Operation	(5) Quantity Required F/8 Hrs Operation	(6) Notes
CRANKCASE DIESEL ENGINE		OIL LUBRICATING: 55-gal drum as follows: MIL-L-45199A:			(1) Includes quantity of oil to fill engine oil system as follows: 25 qt—Crankcase. 2 qt—Filters.
	9150-680-1104 (2)	HDO-30	27 qt	(3)	(2) See C9100-IL for additional data and requisitioning procedure.
	9150-680-1105 (2)	HDO-10	27 qt	(3)	(3) See current LO for grade application and replenishment intervals.
	9150-242-7605 (2)	OES	27 qt	(3)	(4) Use oil as prescribed in item 1 above.
FUEL TANK		FUEL OIL, DIESEL: Bulk as follows:			(5) Tank capacity.
	9140-286-5294 (2)	DF-2 (Regular)	65 gal (5)	56 gal (6)	(6) Average fuel consumption is 7 gal per hour of continuous operation.
	9140-286-5286 (2)	DF-1 (Winter)	65 gal (5)	56 gal (6)	(7) 9¼ quarts each side.
	9150-286-5283 (2)	DFA (Arctic)	65 gal (5)	56 gal (6)	
RADIATOR		WATER: ANTIFREEZE: 55-gal drum as follows:			
	6850-664-1409	Anti-freeze: Ethylene glycol.	11 gal		
	6850-174-1806	Anti-freeze: Compound arctic.	11 gal		

GREASE POINTS	9150-190-0905	GREASE, AUTOMOTIVE AND ARTILLERY: 5 lb can as follows: GAA	5 lb	(3)
TRANSMISSION		OIL, LUBRICATING (4):		
		HDO-30	40 qt	(3)
		HDO-10	40 qt	(3)
		OES	40 qt	(3)
FINAL DRIVE		MULTIPURPOSE TYPE: Gear Lubricant:		
	9150-597-5841 (2)	GO-90	9½ qt ea (7).	
	9150-257-5440 (2)	GOS	9½ qt ea (7).	
POWER CONTROL UNIT.		OIL, LUBRICATING (4):		
		HDO-30	1 qt (1)	(3)
		HDO-10	1 qt (1)	(3)
		OES	1 qt (1)	(3)
HYDRAULIC STEERING CLUTCH.		OIL, LUBRICATING (4):		
		HDO-30	5 qts	
		HDO-10	5 qts	
		OES	5 qts	

Page A-1. Appendix A is superseded as follows:

APPENDIX A

BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

A-1. Scope

This appendix lists basic issue items, items troop installed or authorized which accompany the tractor and are required by the crew/operator for operation, installation, or operator's maintenance.

A-2. General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List—Section II. Not applicable.

b. Items Troop Installed or Authorized List—Section III. A list in alphabetical sequence of items which at the discretion of the unit commander may accompany the end item, but are NOT subject to be turned in with the end item.

A-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR): Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR Code	(2) Federal Stock Number	(3) Description — Ref No. & Mfr Code / Usable on Code	(4) Unit of Meas	(5) Qty Auth
	7520-559-9618	CASE, Maintenance and Operation Manual.	EA	1
	4210-889-2221	EXTINGUISHER, Fire	EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25B, (Qty Rqr Block No. 474) Organizational maintenance requirements for Tractor, Tracked, Light.

Changes in force: C 2, C 4 and C 5

TM 5–2410–229–12
***C 5**

CHANGE
No. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, *5 July 1974*

Operator and Organizational Maintenance Manual
TRACTOR, FULL TRACKED,
DIESEL DRIVEN, AIR DROPPABLE
(CATERPILLAR MODEL D6B) FSN 2410–926–0910

TM 5–2410–229–12, 5 April 1968, is changed as follows:

Inside Front Cover. Add the following warnings to the list of safety precautions:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional. (Ref TB MED 251.)

WARNING

Dry cleaning solvent, P–D–680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F.-138°F.

Page 6. After "Operation Instructions", add the following warning:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional. (Ref TB MED 251.)

Page 9, change 2. Appendix B, Group 61, Track group; place the letter "D" in column K.

*This change supersedes C 3, 2 March 1971.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12–25B (qty rqr block No. 474) Organizational Maintenance requirements for Tractor, Tracked: Medium.

TM 5-2410-229-12

TECHNICAL MANUAL

NO. 5-2410-229-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 5 April 1968

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

TRACTOR, FULL TRACKED, DIESEL DRIVEN, AIR DROPPABLE

(CATERPILLAR MODEL D6B) FSN 2410-926-0910

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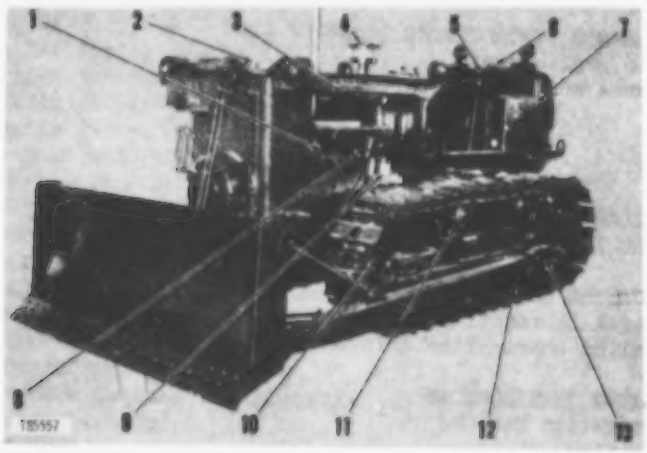
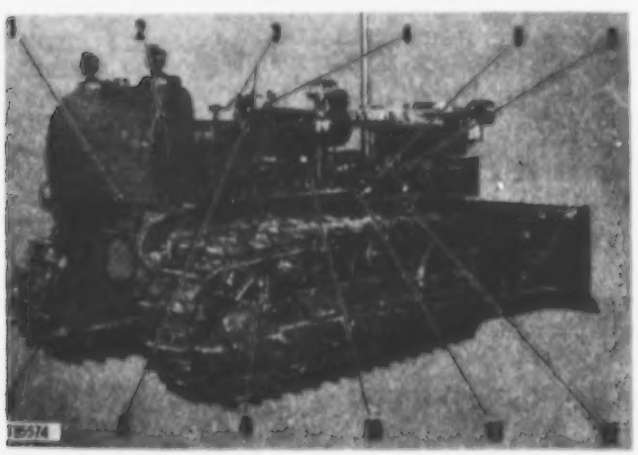
PART ONE
CATERPILLAR D6B TRACTOR, SERIAL NUMBERS 37A1-UP



D6B TRACTOR (AIR DROPPABLE) – LEFT FRONT VIEW

1–DIESEL ENGINE CRANKCASE OIL COOLER. 2–RADIATOR FILLER CAP. 3–DIESEL ENGINE AIR CLEANER. 4–PRE-CLEANER. 5–FLYWHEEL CLUTCH CONTROL LEVER. 6–DIESEL FUEL TANK FILLER CAP. 7–BATTERY COMPARTMENT. 8–DIESEL ENGINE CRANKCASE FILLER CAP. 9–DIESEL ENGINE CRANKCASE OIL FILTERS. 10–FRONT IDLER. 11–TRACK CARRIER ROLLERS. 12–TRACK ROLLERS. 13–TRACK ROLLER FRAME.



D6B TRACTOR (AIR DROPPABLE) – RIGHT REAR VIEW

1–DIESEL FUEL TANK VALVE AND DRAIN COCK 2–HANDLE. 3–STEERING CLUTCH CONTROL LEVERS. 4–GEAR SELECTOR LEVER. 5–FUEL INJECTION PUMP HOUSING. 6–FUEL FILTER HOUSING. 7–DRAWBAR. 8–FORWARD AND REVERSE SELECTOR LEVER. 9–SPROCKET. 10–SLAVE RECEPTACLE. 11–GOVERNOR CONTROL HOUSING. 12–PRIMARY FUEL FILTER.

LUBRICATION INSTRUCTIONS

General Lubrication Information

Lubrication Order 5-2410-229-12, which is on the tractor, prescribes the lubrication requirements of the tractor.

Detailed Lubrication Information

Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready to use.

Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrications points after lubricating to prevent accumulation of foreign matter.

Service the lubrication points at proper intervals as illustrated on the lubrication order.

The oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather operation conditions.

Operation Instructions

PREPARING THE TRACTOR FOR USE

New Tractor Initial Service: The first duty of anyone charged with the care and operation of a tractor is to give it a detailed inspection, and to lubricate all parts as directed in the LUBRICATION ORDER.

Fill the diesel fuel tank, taking care no dirt, water, or other foreign substances are admitted with the fuel. Give particular attention to the details of fuel handling as outlined under the topic, CARE OF THE FUEL SUPPLY.

Fill the cooling system with clean soft water and rust inhibitor, or with the correct anti-freeze solution if temperatures below freezing are likely to be encountered. See the topic, COOLING SYSTEM.

During the initial operation of the tractor, the track roller end collar bolts, track shoe bolts, and equalizer spring clips should be checked and tightened if necessary. Since these parts are subjected to continued stress, daily checks should be made to prevent forced stops. See the topic, DAILY CARE.

New Tractor Recheck: After the first 100 to 125 service hours of operation, tighten the diesel engine cylinder head bolts, the exhaust manifold, and adjust the valves as described in the topic, DIESEL ENGINE VALVE CLEARANCE ADJUSTMENT

During the initial operation of the tractor the sprocket hub bearings are likely to require some adjustment. See the topic, FINAL DRIVE SPROCKET HUB BEARINGS.

New Operator's Responsibility: The operator who is given the responsibility of care and operation of a tractor already in service, should first, check it for necessary lubrication, fuel supply and coolant in the radiator and secondly, the tractor should have any necessary adjustments made to obtain satisfactory performance.

STARTING THE ENGINE

Before Starting: Be sure to check the oil level in the diesel engine crankcase. With engine stopped, make sure oil level is in the crosshatched safe starting range. When checking an engine not running with a gauge marked only for checking with engine running, be sure the oil level is within an inch of the full mark. Start the engine and as soon as the engine is warm, recheck the level. Check the oil level in the flywheel clutch compartment to make certain the oil is to the proper level on the gauge.

Electric Starting

The diesel engine 24 volt electric starter can be used successfully in temperatures of 60°F. (16°C.), or above without the use of starting aids. In temperatures below 60°F. (16°C.), it is recommended that the glow plugs be used to assist starting. When starting in temperatures below 32°F. (0°C.), it is advisable to use ether starting aid attachment in addition to the glow plug starting aid. In temperatures below 20°F. (−7°C.), it may be necessary to warm crankcase lubricating oil and/or the coolant for quicker starting. See the topics, OPERATING STARTING AIDS and STARTING IN COLD WEATHER.

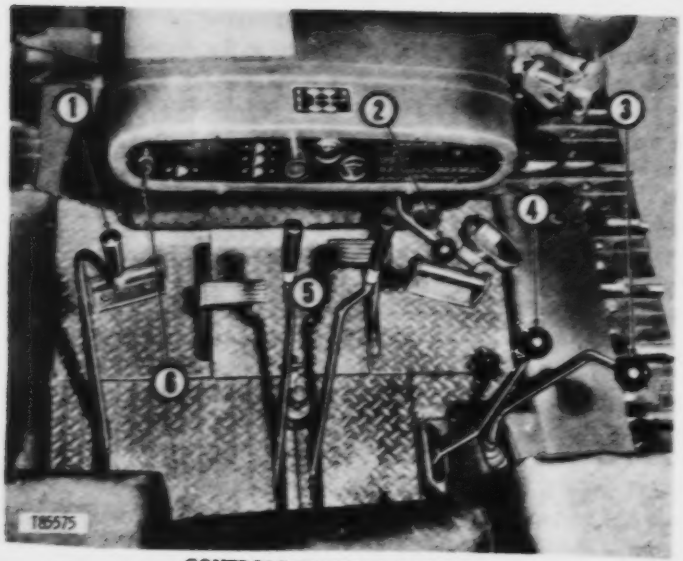
The engine must be kept in the best mechanical condition possible, the batteries kept fully charged and all terminals kept clean and tight for satisfactory performance of the starting system in lower atmospheric temperatures. In extremely cold temperatures any use of an acceptable means of heating the engine will make starting easier.

Position Controls For Starting: Before attempting to start the diesel engine the controls should be correctly positioned as follows:

1. **Disengage the flywheel clutch by pushing the lever (1) forward.**
2. **Shift the gear selector lever (3) and forward and reverse lever (4) to the neutral position.**
3. **Push down the right steering clutch brake pedal (5) and lock it with the brake lock.**
4. **Move the governor control lever (2) to approximately half engine speed position.**
5. **Insert the key in the disconnect switch and turn the switch ON.**

CAUTION

Never turn disconnect switch OFF when the engine is running or damage to electrical system components may result.

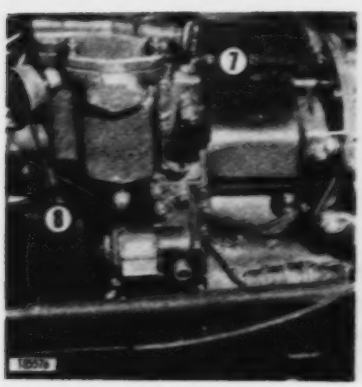


CONTROLS IN START POSITION
1–FLYWHEEL CLUTCH CONTROL LEVER, 2–GOVERNOR CONTROL LEVER, 3–GEAR SELECTOR LEVER, 4–FORWARD AND REVERSE LEVER, 5–RIGHT BRAKE PEDAL, 6–HEAT–START SWITCH.

Starting The Diesel Engine: After positioning the controls correctly, the diesel engine may be started as follows:

1. Operate the fuel priming pump (7) until the fuel pressure gauge indicator (8) registers in the NORMAL (green) range.

   Priming the fuel system may be necessary to obtain quicker starts on engines where the fuel level in the



STARTING THE DIESEL ENGINE
7–FUEL PRIMING PUMP,
8–FUEL PRESSURE GAUGE.

DISCONNECT SWITCH

diesel fuel tank is low in relationship to the fuel filter. See the topic, PRIMING THE FUEL SYSTEM.

2. Move the HEAT-START switch (6) to the START position. As soon as the engine starts, release the switch.

3. If the engine does not start in a few seconds, continue to crank the diesel engine but shut off the fuel supply by moving the governor control lever to the shut-off position for about ten seconds to clear the cylinders of raw fuel.

   If the diesel engine fails to start within thirty seconds, release the switch and wait two minutes to allow the electric starter to cool before using it again.

   If the electric starter pinion disengages for any reason before the engine starts, release the switch and wait until the electric starter stops rotating and the diesel engine stops "rocking" before again turning the switch to the START position.

After the engine starts, reduce engine speed to low idle until the oil pressure gauge indicates normal oil pressure. When the gauge indicates normal oil pressure, the engine should be allowed to run for five minutes with the governor control lever in approximately half engine speed position before applying the load. During this period the engine gauges should be observed for proper readings as explained in the topic, GAUGES. Avoid unnecessary accelerating of the engine speed before operating temperatures are obtained.

OPERATING STARTING AIDS

Ease of starting the diesel engine can best be obtained by following the instructions closely giving particular attention to the glow plug heating time and ether capsules to use. For easy cranking, quicker starting and rapid oil distribution, the coolant and crankcase lubricating oil should be warmed under conditions as indicated in the chart. When heating the cooling system, the coolant temperature should be maintained between +15°F. and +30°F.

Helpful suggestions for starting the diesel engine in cold weather are in the topic, STARTING IN COLD WEATHER.

The controls should be positioned as instructed in the topic, STARTING THE ENGINE, and the following additional instructions should be carefully followed. This will permit the quickest possible start and conserve the battery. See the STARTING AID CHART.

STARTING AID CHART

STARTING TEMPERATURE	GLOW PLUG HEAT TIME	ETHER AID WHILE CRANKING
Above 60°F.	None	No
Between 60°F. and 32°F.	1 Minute	No
Between 32°F. and 20°F.	2 Minutes	Yes
*Between 20°F. and 0°F.	2 Minutes	Yes
*Below 0°F.	2 Minutes	Yes

*Heating coolant and crankcase oil when starting under these conditions may be required. For starting below 0°F., use of heavy duty batteries is recommended.

Glow Plugs

The glow plugs preheat the combustion chambers so that a minimum of cranking time is required. Turning the HEAT - START switch, to the HEAT position causes the glow plugs to heat.

1. To heat the glow plugs, move and hold the HEAT-START switch in the HEAT position for the length of time necessary as indicated in the STARTING AID CHART.

HEAT AND START SWITCH

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NOTE

Each glow plug uses approximately 5 amperes while the switch is in the HEAT position. This is actually a small amount in comparison to the starter load of possibly as many as 800 amperes that is imposed on the battery when the switch is in the START position.

2. **Move the switch to the START position to crank the engine. As soon as the engine starts, return the switch to the HEAT position until the engine is running smoothly.**

If the engine fails to start after 10 seconds of cranking, move the switch to the HEAT position for about 30 seconds before cranking the engine

again. When the starting motor is cranking, the battery voltage is reduced and the glow plugs cool. Reheating them after 10 seconds of cranking makes the glow plugs more effective and conserves the battery.

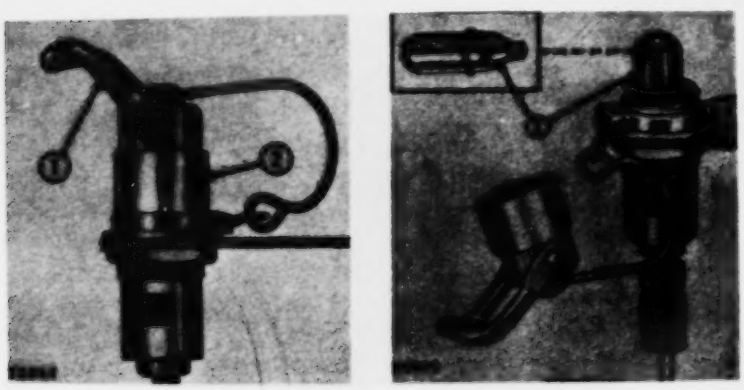
Do not turn the HEAT-START switch to the HEAT position while the engine is warm and running.

Ether Starting Aid

Ether ignites very readily so it can be used to assist starting. Pressurized ether dispensers or an ether starting aid attachment should be used with care as outlined in the following instructions. If a pressurized ether dispenser is to be used as a starting aid, carefully spray ether toward the air cleaner inlet while cranking the engine. For proper handling of pressurized ether dispensers, follow the manufacturer's instruction printed on the dispenser.

The ether starting aid attachment provides ether in metal capsules of a definite size to limit the quantity of ether to be injected. A discharger is used to inject ether into the inlet manifold. When the discharger lever is moved the metal capsule is pierced. Ether is forced out of the capsule by a small quantity of gas, under high pressure, into the inlet manifold to be taken into the cylinder for quick starting.

1. Load the discharger by unscrewing the nut **(2)**, removing the spent capsule and placing the new capsule **(3)** in the discharger as shown. Install the nut finger tight.



ETHER DISCHARGER
1–Discharging lever. 2–Nut. 3–Capsule.

2. Move the HEAT-START switch to the HEAT position for the length of time necessary as indicated in the STARTING AID CHART.

3. Discharge ether by moving the discharger lever **(1)** to pierce the capsule.
   Actual experience will determine the number of capsules required for easy starting.

4. Start the engine using the starting method provided.
   Be sure the spent capsule is left in the discharger when the engine is running and the nut **(2)** is finger tight on the discharger to keep dirt out of the engine.

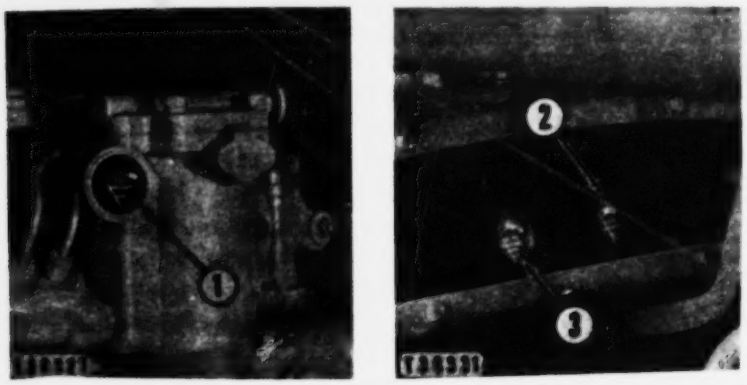
CAUTION

Use only enough ether to start the diesel engine or keep it running if the engine starts to stall. Do not discharge more than 2 ether capsules without cranking the engine.

If more than one capsule is needed in the manifold, discharge the first two capsules and install the second set of capsules in the dischargers before cranking the diesel engine. Only one or two capsules should be discharged into the manifold before cranking the engine. The discharge of the second set of capsules can be performed when the engine has been cranked a few revolutions, or when it starts to stall.

GAUGES

After the engine starts, and at frequent intervals while the engine is operating, the gauges should be observed for proper readings as explained in the following paragraphs:



GAUGES
1–Fuel pressure gauge. 2–Water temperature gauge.
3–Crankcase lubricating oil pressure gauge.

Oil Pressure Gauge: Immediately after the engine starts, check the crankcase lubricating oil pressure gauge **(3)** to see that it is registering pressure. When the engine is running at rated engine speed the gauge should register in the OPERATING RANGE. A lower pressure reading is normal at low idling speeds. If no pressure is indicated, investigate at once.

Water Temperature Gauge: The indicator on the water temperature gauge **(2)** should register in the OPERATING RANGE. The water tem-

perature regulators within the diesel engine cooling system are designed to give an approximate minimum coolant temperature of 160° F. (71° C.). The maximum operating temperature will vary according to the air temperature and load factor, but should never exceed boiling temperature at the prevailing altitude.

Fuel Pressure Gauge: The indicator on the fuel pressure gauge **(1)** should register in the NORMAL (white) range. See the topic, FUEL FILTERING SYSTEM.

Ammeter: Check the ammeter, if so equipped, to see that the indicator is registering in the charging range (indicator on the + side of zero). If the indicator registers in the discharging range (indicator on the — side of zero) investigate at once. See the topic, ELECTRICAL SYSTEM.

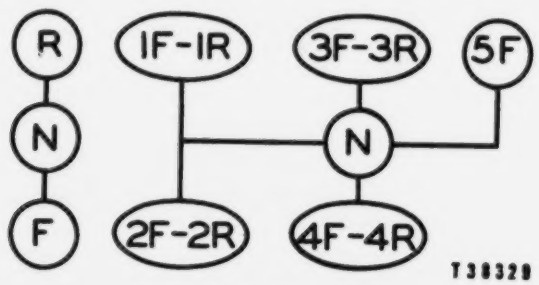
DRIVING THE TRACTOR

When the engine has been running long enough to warm up, move the governor control lever to the low idle speed position. Disengage the flywheel clutch by pressing the clutch control lever forward as far as it will go. This applies the clutch brake. Continue to press forward on the lever until the clutch shaft stops turning. Carefully move the gear selector lever into position for the speed desired.

The clutch lever controls the locking mechanism that holds the sliding transmission gears in position, so the gears cannot be shifted into or out of mesh with the clutch engaged. Always shift gears completely into mesh. Unlock the steering clutch brake pedal to release the brake.

Carefully engage the flywheel clutch until the slack is taken up between the tractor and the load. When the tractor begins to move the load, pull the clutch lever all the way back so the engaging mechanism will snap over center and remain fully engaged. Never move a load with the flywheel clutch only partially engaged as this causes heating and rapid unnecessary wear on the clutch plates.

There are five forward and four reverse speeds in the transmission. Each of the four lower forward speeds has a comparable, slightly higher, reverse speed. Shifting from forward to reverse or reverse to forward



GEAR SELECTION DIAGRAM

in any of these four speeds is accomplished without shifting the gear selector lever. It is accomplished by disengaging the flywheel clutch and shifting the forward and reverse gear shift lever forward to operate in reverse, and backward for forward travel.

The tractor will move forward in fifth gear without the forward and reverse lever being in forward direction position. However, to insure adequate lubrication of the transmission gears and bearings, the forward and reverse lever should be in the forward direction position when operating the tractor in fifth speed.

STEERING THE TRACTOR

The tractor is steered by hand levers that operate the steering clutches, and by pedals that control the steering clutch brakes. The hydraulic control arrangement operates in conjunction with the steering clutch controls and minimizes the effort required to release the clutches during operation of the tractor. Release the steering clutch on the side toward which the turn is to be made by pulling back on that steering clutch control lever. Apply the brake on the same side by pressing down on the pedal just hard enough to turn at the desired angle. Both controls should be handled smoothly so the turn will be made evenly, and not as a series of jerks. Just before the turn is completed, release the brake. Then engage the steering clutch by releasing the control lever quick but gently.

When the tractor is pulling a load, it is seldom necessary to use the brakes in steering except for sharp turns, since the load acts as a brake. The brakes may also be used to hold the tractor back when going down grade. The right pedal may be locked in position to hold the tractor on slopes or when doing stationary work, by first depressing the pedal and then pushing forward and down on the steering clutch brake lock.

The pedals must be in the fully released position during the normal operation of the tractor. **Keep the feet off the pedals except when it is necessary to use the brakes.**

Steering Down Grade: When going down grade with the tractor pulling the load, steer in the usual manner. If the load is pushing the tractor, the operation of the steering clutches should be reversed. For example, to turn to the right under these conditions, release the steering clutch on the left, but do not apply the brake. This allows the left track to travel faster while the right track is held back by the engine which acts as a brake.

Do not disengage the flywheel clutch when operating downgrade except to change gears. When the tractor speed increases, due to down hill operations, excessively high engine speeds can be encountered regardless of the transmission gear selection. To avoid overspeeding the engine, both steering clutch brakes should be applied at the same time.

OPERATING OVER AN OBSTRUCTION

The fact that the steering clutches are controlled by separate levers may be used to advantage in running over an obstruction, such as a log or a ditch bank. Both of the clutches may be released slightly until the tractor balances on top of the obstruction. Then one clutch may be engaged gradually so the tractor moves forward at an angle, over and down. If the tractor is being operated without a load it may be necessary to use the brakes.

OPERATING IN DEEP MUD OR WATER

If the tractor must be operated for any length of time in deep mud or water, certain precautions are necessary. See that the plugs are in place under the steering clutch compartments. Inspect the oil in the final drives frequently for mud or water and drain, wash and refill as soon as the oil shows presence of mud or water. The presence of mud or water in the final drives or the excessive leakage of oil indicates the seals should be repaired.

STOPPING THE TRACTOR

To stop the tractor when it is desired to allow the engine to continue to run, disengage the flywheel clutch and move the governor control lever to reduce engine speed. Place the gear selector lever in neutral position. **With the forward and reverse lever in either forward or reverse position engage the flywheel clutch.**

The brake lock control is provided to lock one steering clutch brake in the applied position to hold the tractor on slopes or when doing stationary work. To lock the brake apply the right steering clutch brake and push forward and down on the brake lock control.

BRAKE LOCK CONTROL

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CONTINUOUS OPERATION ON STATIONARY WORK

When operating any attachment which calls for stationary tractor power, or when allowing the tractor to stand with the engine idling for any long period of time, these important instructions should be followed:

1. Place the gear selector lever in neutral position.
2. Place the forward and reverse lever in either forward or reverse position.
3. Engage the flywheel clutch.

When these instructions are followed all the transmission gears, shafts and bearings are lubricated.

STOPPING THE DIESEL ENGINE

After the normal load is removed from the engine allow it to idle five minutes with the governor control lever at half engine speed position before stopping.

Move the governor control lever to the extreme forward position to shut off the fuel injection pumps. Leave the diesel fuel tank valve open.

Machines Equipped With Direct Electric Starting: When the diesel engine is stopped, turn the disconnect switch to the OFF position to open the circuit between the battery and the remainder of the electrical system. The disconnect switch is provided for four reasons: first to prevent actuating the starting motor or glow plugs if the HEAT and START switch is moved accidentally. Second, to prevent damaging the electrical system

when performing service operations on the equipment. Third, to prevent discharging the batteries when the tractor is not in operation. Fourth, to prevent unauthorized starting of the tractor.

DAILY CARE

Attention should be given to the operations mentioned in this topic every 10 service hours or daily, whichever occurs first.

A daily check of the tractor should be made to see if there are any loose nuts, bolts, or parts worn to such an extent that they are no longer serviceable. Points to be checked daily for tightness or leaks are listed as follows:

1. Gasketed joints of final drive cases, inspect for tightness.
2. Exhaust manifold and air cleaner connections, inspect for tightness.
3. Track shoe bolts, inspect for tightness.
4. Track roller end collar bolts, inspect for tightness.
5. Cooling system, clean trash from radiator core and add coolant or anti-freeze if necessary.
6. Fuel pressure gauge, inspect with engine running to see that indicator is not in red range.
7. Precleaner, inspect for dirt in the body when operating in extremely dusty conditions.
8. Sprocket hub, track rollers, carrier rollers and front idler seals, inspect for leakage.

Fill the diesel fuel tank full at the end of the day's run. See the topic, CARE OF THE DIESEL FUEL TANK for other periodic care.

Dirt should not be allowed to accumulate on the tractor. A few minutes spent daily in keeping it clean are well repaid in improved appearance, and greater ease and safety in operation, lubrication and maintenance.

SEAT CUSHION TIPPED TO PROTECT PADDING

If the tractor must stand without shelter the operator's seat cushion should be tipped. When this is done the waterproof covering prevents moisture entering the padding under the covering. If the cushion is turned bottom side up in rainy weather the padding under the waterproof covering may become damp. This moisture with accumulated dirt and heat will shorten the life of the cushion.

STARTING IN COLD WEATHER

If the starting engine and the diesel engine are both in good mechanical condition, and the precautions necessary for cold weather operation are taken, ordinary cold weather will not cause difficulty in starting or loss of efficiency.

Lubricants: As the starting atmospheric temperatures become lower, where warm housing facilities are not available, lubricants of lower viscosity should be used.

Coolant: When the temperature is below freezing, sufficient anti-freeze solution should be used in the cooling system to prevent freezing. See the topic, COOLING SYSTEM.

The liquid in the cooling system may be warmed to make starting easier and quicker. When warming anti-freeze solutions, keep away from flames, as some of these solutions may be inflammable. Avoid getting the solution hot, and even a warm solution should be poured very slowly into a cold cooling system to prevent damage by sudden expansion.

Fuel: Fuel must be "free flowing" enough to flow readily through the fuel lines at the lowest temperature at which the tractor will be started and operated. For additional information on this subject, see the topic, FUELS.

Electrical Equipment: During cold weather, more attention should be given the condition of the battery. It should be tested frequently and charged as often as necessary to insure sufficient power for starting. All switches and connections in the electrical system should be inspected and kept in good condition to prevent losses through improper contacts. See the topic, BATTERY.

STORAGE

Lubricate all points mentioned in the lubrication order if the tractor is to be stored or left standing for any length of time. This will protect against rusting.

Diesel Engine: If the tractor is to be stored or left standing for a long period of time, the lubricating oil may drain away from the cylinder walls and piston rings. This lack of lubricant permits the rings and liners to rust. It also permits unnecessary wear caused by metal-to-metal contact between the pistons, rings and liners when the engine is started before fresh oil has reached these surfaces. The lack of lubricant may not cause any noticeable change in engine operation after it has been started but it does contribute to shorter engine life.

The oil film should be renewed once a week by running the diesel engine until thoroughly warm. This will circulate the oil and prevent rusting from condensation.

Transmission and Final Drive Compartments: Drive the tractor a short distance every 30 days to renew the oil film on shafts, gears, and bearings. A convenient time to do this would be when starting the engine to renew the oil film on the cylinder walls and piston rings.

Battery: Keep the battery charged by running the engine once a week.

When replacing a battery that has been removed, make certain the correct battery post is connected to the ground cable. Failure to connect the battery terminal to the correct post will result in damage to the electrical system. See the topic, WIRING DIAGRAM.

Fuel Tank: If the machine is to be stored or left standing longer than a normal work day, fill the tank with clean fuel to keep out moisture laden air. This will prevent condensation and rust from forming inside the tank. If the machine is to be stored with the fuel tank not completely filled, rust preventive crystals should be placed in the tank filler strainer to prevent moisture and rust from collecting. Remove the crystals before the fuel tank is to be refilled with fuel.

Cooling System: If the temperature will be below freezing, the cooling system should be drained if it has not been serviced as indicated in the topic, COOLING SYSTEM.

Maintenance Instructions

The foregoing paragraphs have been devoted to instructions which are necessary for day-to-day operation of the tractor. The following topics give detailed instructions regarding the care and adjustment of the various parts.

AIR CLEANERS

The dry type air cleaners are used without oil.

Regular service intervals, along with close visual inspection of the precleaner and dry type air cleaner, are necessary for proper cleaning of the engine inlet air. The service interval will vary with the weather and working conditions. During dry, dusty months where dust conditions are severe, it will be necessary to service the precleaner and air cleaner frequently. In damp weather and other conditions of little or no dust, the service interval can be extended.

Diesel Engine Dry Type Air Cleaner

To extend the service life of the element, the exhaust and air cleaner inlet pipes should be arranged so that exhaust and/or oil fumes do not enter the engine air cleaner.

An extra filter element should be kept on hand for replacement or for use in the air cleaner while the element that was removed is being cleaned.

Visual inspection of the gaskets is important in keeping dust from bypassing the air cleaner filter element. Air leakage can upset proper air cleaner action. If the condition of the gaskets is questionable, replace them. If the sealing ends of the filter element or the element pleats are damaged, replace the element.

Excessive engine exhaust smoke and/or loss of power may indicate the need for servicing the air cleaner. **Never service the air cleaner while the engine is running.**

AIR CLEANER
SERVICE INDICATOR

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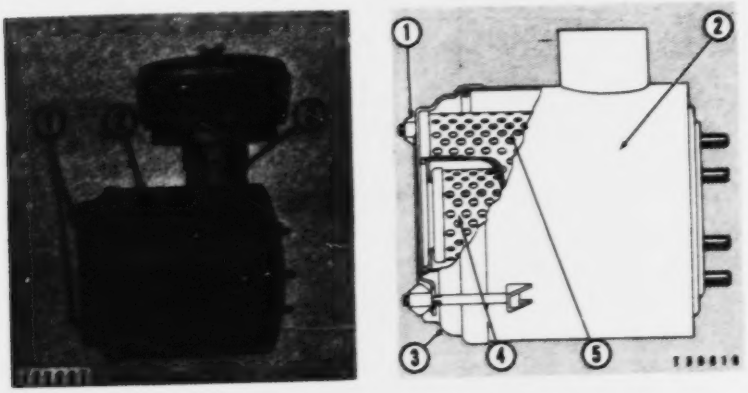
The Air Cleaner Service Indicator is connected to the air inlet passage between the air cleaner and the engine. It contains a red marked piston, which gradually rises with restriction to the air flow. When the entire piston is visible it will lock in this position. This indicates a need for air cleaner service. The piston will remain in this position whether or not the engine is running. After servicing the air cleaner, reset the piston by depressing the plunger in the bottom of the indicator.

Primary Filter Element: Every 125 to 250 service hours, in average operating conditions, remove the primary filter element **(5)** for inspection and



DRY TYPE AIR CLEANER
1–Wing nuts. 2–Filter case. 3–Cup. 4–Secondary filter element. 5–Primary filter element.

cleaning. This period may be extended in clean atmosphere and can only be determined by experience.

1. Loosen the wing nuts **(1)** and remove the cup **(3)** of the filter case **(2)**.
2. Remove the primary filter element **(5)**.
3. Remove any dirt which has accumulated on the bottom of the case and clean the filter element using one of the methods covered in the topic, FILTER ELEMENT CLEANING.
4. Thoroughly clean all parts of the air cleaner. Inspect gaskets and install new ones if they are damaged.
5. Install the primary filter element and cup and tighten the wing nuts. This air cleaner requires no oil.

Secondary Filter Element: Every 1000 service hours, remove and service both the primary and secondary elements.

1. Remove the stud nuts that secure the secondary filter element **(4)** and filter case **(2)** to the diesel engine air inlet.
2. Remove the air cleaner assembly and cover the air inlet to the engine.

3. Remove the cup as instructed in the preceding topic.
4. Remove the primary and secondary filter elements.
5. Remove any dirt which has accumulated on the bottom of the case and clean the filter elements using one of the methods covered in the topic, FILTER ELEMENT CLEANING.
6. Thoroughly clean all parts of the air cleaner. Inspect all gaskets and install new ones if they are damaged.
7. Assemble the secondary filter element and air cleaner body to the air inlet using a new gasket.
8. Install the primary filter element and cup, and tighten the wing nuts. This air cleaner requires no oil.

If after cleaning, the engine exhaust smoking and/or loss of power has not been corrected, or the restriction has not been reduced, replace the elements with new elements.

Replace the filter elements at least once a year.

Filter Element Cleaning:

The ends of the filter element can be damaged by bumping or tapping. Bent and/or dented ends cannot seal properly and may allow unfiltered air to enter the engine cylinders thus causing premature engine wear.

Clean the filter element using one of the following methods:

1. Using clean, dry air, at a pressure not to exceed 100 PSI, proceed as follows:

   Direct air at an angle against the inside (engine side) of the element to loosen any imbedded dirt. Best results can be obtained by moving the air hose so that air is directed at an angle along the complete length of each pleat.

   Blow off loose dirt by directing air against the outside of the element.

   Repeat this procedure until the element is clean. Make certain that no dirt is inside the element.

2. Using clean water, at a pressure not to exceed 40 PSI, proceed as follows:

   Direct water at an angle against the inside (engine side) of the element to loosen any imbedded dirt. Best results can be obtained by using a water hose without a nozzle and moving it so that water is directed at an angle along the complete length of each pleat.

   Wash off loose dirt by directing water against the outside of the element.

   Repeat this procedure until the element is clean. Make certain that no dirt is on the engine side of the element, and thoroughly dry the element before installing it.

Precleaner Care

Remove and empty the body assembly when the dirt reaches the line on the body assembly, or when it becomes three-fourths full, by loosening the wing nut **(1)** that holds the cover and body assembly **(2)** in place. Inspect the fins in the precleaner regularly, and when they are dirty, remove the entire precleaner, and wash it in water.

PRECLEANER

1–Wing nut. 2–Cover and body assembly.

◆

WASHING THE CRANKCASE

Whenever the diesel engine oil pan is removed for any reason it should be thoroughly cleaned before it is reinstalled. The oil pump screen should also be cleaned while the oil pan is off the engine.

FUELS

As a source of power the diesel engine has two outstanding advantages over the gasoline engine. The first is its lower rate of fuel consumption and second, its ability to use less expensive fuels. In selecting a fuel, it should be pointed out that distillates are especially desirable because, in refining, they are heated to a vaporous state and condensed in another container; thus, all the sediment and residue remain in the still. Always buy the **lowest priced distillate fuel giving satisfactory operation.**

In the United States and Canada, there are two general classes of fuel available for diesel engines. The American Society for Testing Materials (ASTM) has established these classes in their specifications. One class is that group of fuels marketed as fuel oil (domestic furnace oil); the other is that marketed as diesel fuel oil. No. 2 fuel oil and No. 2D diesel fuel oil are recommended for use in Caterpillar Diesel Engines. More expensive "premium" fuels such as No. 1 fuel oil and No. 1D diesel fuel oil are not necessary or recommended for normal operating conditions.

There is considerable variation in the composition of fuels distributed under the No. 2 grade classifications. For desirable engine service, it is most important to give special attention to pour point, cloud point, filterability, sulphur content and cetane number of the fuel.

Pour Point: The pour point of the fuel has no effect on engine performance, as long as the fuel is fluid enough to flow from the diesel fuel tank to the engine fuel transfer pump. The pour point of the fuel should be at least 10°F. below the lowest atmospheric temperature at which the engine must start and operate. This will generally provide a fuel that will flow

readily from the fuel tank to the engine fuel transfer pump. In subzero (−18°C.) weather it may be necessary to use No. 1 fuel oil or No. 1D diesel fuel oil to obtain unusually low pour point fuels.

Cloud Point: Cloud point is a low temperature property frequently not reported in fuel characteristics. It is the temperature at which wax crystals become visible, and it is generally above the pour point of the fuel. The cloud point should be below the lowest atmospheric temperature at which the engine will be operated so the filter will not be plugged with the wax formation.

Filterability: A good clean fuel should contain no more than .1% sediment and water. Dirty fuels lead to early filter plugging and in addition, with some fuels, fuel stability and fuel compatibility can result in the formation of gums and resins which will also reduce filter life.

Sulphur Content: As the sulphur content of the fuel increases, the oil change periods should be reduced as indicated in the topic, DIESEL ENGINE CRANKCASE LUBRICATING OIL CHANGE PERIODS.

Cetane Number: This is an indication of a fuel's ignition quality and should never be less than 35 for Caterpillar Engines. A higher cetane number is required at higher altitudes and for easier starting at low temperatures.

CARE OF THE FUEL SUPPLY

Keep the Fuel Clean: Too much emphasis cannot be placed on the importance of using only clean diesel fuel. It is important to buy clean fuel, and keep it clean. The best fuel can be rendered unsatisfactory by inadequate storage facilities or careless handling. The clearance between the fuel injection pump plunger and the barrel is very small, actually less than .0001 inch (0.00254 mm.), which makes it evident that the invisible particles of dirt which might pass through the filters can damage these finely finished parts.

Effort should be constantly expended to prevent contamination of the fuel. Important steps are to use clean containers and funnels and to reduce the number of times the fuel must be handled. When the fuel can be delivered by the distributor to fuel storage tanks and then pumped from the fuel storage tank to the diesel fuel tank, the handling is reduced to a minimum.

Since natural settling is an effective method of cleaning diesel fuel, the fuel should be allowed to stand at least 24 hours in the fuel storage tank after it has been filled before fuel is transferred to the diesel fuel tank. Be

sure to drain all water and sediment that has settled to the bottom of the tank before the tank is refilled. Occasionally, drain all of the fuel and clean the tank thoroughly.

CARE OF THE DIESEL FUEL TANK

Diesel Fuel Tank: Fill the diesel fuel tank at the end of the day, because the incoming fuel will drive out the moisture-laden air and prevent condensation. The fuel level in the diesel fuel tank may be checked with the plunger gauge in the filler opening. Every 125 service hours before starting the engine, open the drain under the diesel fuel tank and drain off any sediment or water which may have accumulated. The strainer in the diesel fuel tank filler opening should be removed and cleaned regularly. Remove the retainer ring and lift out the strainer.

Diesel Fuel Tank Needle Valves: The diesel fuel tank drain needle valve **(1)** is opened by turning the needle counterclockwise approximately three turns or until tight. To close the needle valve, turn the needle clockwise approximately three turns or until tight. The diesel fuel tank fuel line needle valve **(2)** is opened or closed the same way.

On earlier tractors, turn either valve 1/4 turn to open or close.

DIESEL FUEL TANK NEEDLE VALVES

1–Diesel fuel tank drain needle valve.
2–Diesel fuel tank fuel line needle valve.

Diesel Fuel Tank Filler Cap: The diesel fuel tank filler cap elements should be washed every 50 to 250 service hours depending upon the amount of dust in the air. To do this, remove the bolt and take out the baffle plate and gaskets. Wash the cap and elements in a can of kerosene or some non-inflammable cleaning fluid. After the cap is washed pour a small amount of crankcase lubricating oil on the filter elements.

FUEL FILTERING SYSTEM

As either the edge-type filter element in the primary fuel filter or the resin impregnated cellulose material type filter element in the final fuel filter gradually becomes clogged with foreign material, the position

of the fuel gauge indicator will work back from the original position in the NORMAL (white) range, to the CAUTION (green) range, and later nto the OUT (red) range. When the indicator shows in the OUT (red) range, the primary filter element should be removed and washed. If the indicator still shows in the OUT (red) range, the final fuel filter element should be replaced.

Primary Fuel Filter

A primary fuel filter, mounted on the fuel transfer pump housing just below the final fuel filter, is provided in the fuel system for the purpose of straining out foreign material from the fuel before it enters the fuel transfer pump. Every 50 service hours remove and clean the edge-type filter contained within the sediment bowl. Do this by first closing the diesel fuel tank valve, located under the diesel fuel tank, and removing the sediment bowl by unscrewing the nut **(2)** that clamps it to the body. Unscrew the edge-type filter element **(1)** and shake it in kerosene or some non-inflammable cleaning fluid. When the bowl is replaced see that the gasket is clean, in good condition, and correctly positioned. See the topic, PRIMING THE FUEL SYSTEM.

PRIMARY FUEL FILTER

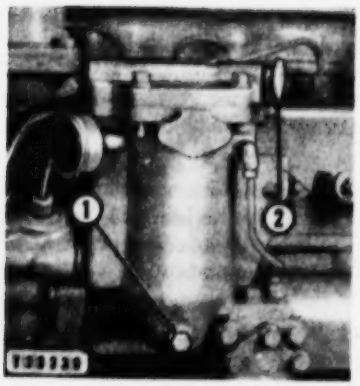
1–Edge-type filter element. 2–Nut.

◆

Final Fuel Filter

Draining Fuel Filter Housing: Every 50 service hours or even as often as daily during extremely low temperatures, drain the filter housing of sediment and water which settles to the bottom of the compartment. Close the diesel fuel tank valve, remove the filter housing drain plug **(1)** and open the filter housing vent **(2)**. Replace the drain plug, and prime the system. See the topic, PRIMING THE FUEL SYSTEM.

Fuel Filter Element: The fuel filter element is of the resin impregnated cellulose material type. When the pleated element has collected enough contamination to interfere with engine performance, it must be replaced with a new one. This element will continue to collect particles until fuel



DRAINING FUEL FILTER HOUSING
1–Drain plug. 2–Vent.

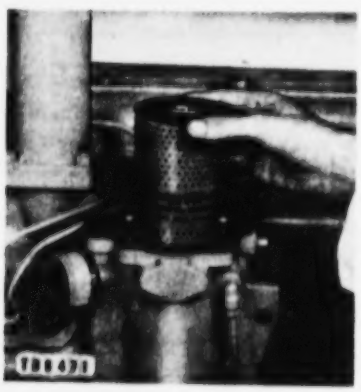
◆

will no longer flow through it at a rate to maintain maximum engine performance. It will not discharge its burden into the clean fuel; this is prevented by the fine grade filter media around the perforated metal core.

The resin impregnated cellulose material type filter element collects and holds contaminants and cannot be washed or otherwise restored.

Removing Used Filter Element: To remove the used filter element proceed as follows:

1. Close the diesel fuel tank valve.
2. Remove the filter housing drain plug.
3. Open the filter housing vent.
4. Thoroughly clean the top of the cover and around the edges of the gasket joint and cover to prevent dirt from dropping into the filter housing when the cover is removed.
5. Remove the filter housing cover.



REMOVING FILTER ELEMENT

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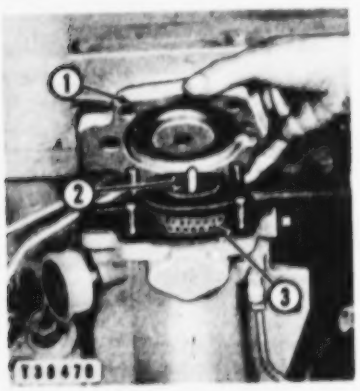
6. Lift the filter element out of the housing. The rod and rod spring may be lifted out of the housing to permit the inside of the housing to be thoroughly cleaned if so desired.

Installing Filter Element in Housing: To install the element in the housing, proceed as follows:

1. If the rod and rod spring have been removed from the housing, replace the spring and then the rod **(2)** in the housing. Make certain the rod end enters the drilled hole in the bottom of the housing and that the spring is piloted on the bosses of the housing and rod.
2. Place the filter element **(3)** over the rod.
3. Place a new gasket on the filter housing.
4. Replace the cover **(1)** and see the topic, PRIMING THE FUEL SYSTEM.

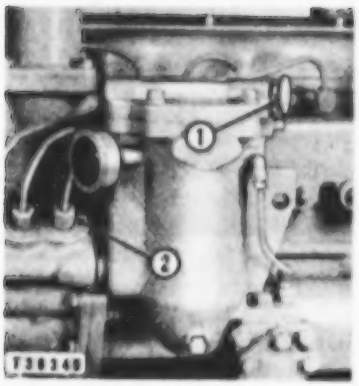


INSTALLING FUEL FILTER ELEMENT
1–Cover. 2–Rod. 3–Filter element.

Keep A New Filter Element On Hand: An extra filter element should be kept on hand for replacement. Always keep the element wrapped and in its original carton to insure against dust and dirt accumulation which will shorten the life of the element if it gets on the outside or may cause damage to the fuel injection equipment if it gets on the inside.

PRIMING THE FUEL SYSTEM

Any time the fuel flow is broken and air is allowed to get into the fuel system, the system must be primed. If air is left in the lines, the fuel system may become air bound, resulting in inability to start the diesel engine or the mis-firing of one or more cylinders.



FUEL FILTER VENTS
1–Vent valve. 2–Fuel injection line nut.

COMPRESSION RELEASE LEVER IN START POSITION
(Direct electric starting)

When Equipped With Direct Electric Starting Motor:

1. Check to see that the diesel fuel tank valve is open.
2. Move the governor control lever to the stop position so the fuel injection pumps are closed.
3. Move the compression release lever to the start position.
4. Open the fuel filter vent valve **(1)** and loosen the fuel injection line nuts **(2)**.
5. Crank the diesel engine with the starting motor until the flow of fuel from the vent and pump lines is continuous and contains no air bubbles, close the vent valve and tighten the line nuts.
6. Place the compression release lever in the run position and then start the engine. If the engine does not run smoothly further bleeding may

be necessary. Open and close the fuel injection line nuts, one at a time, several times in succession to be sure all the air is bled from the system.

A fuel priming pump is available for use with direct electric starting. See the topic, FUEL PRIMING PUMP.

FUEL INJECTION EQUIPMENT

When improper fuel injection is affecting the diesel engine operation, a systematic check should be made to determine the cause. The most likely cause is dirt or water in the fuel. Drain the sediment from the diesel fuel tank, primary fuel filter and final fuel filter housing. Check the fuel pressure gauge as mentioned in the topic, FUEL FILTERING SYSTEM. Replace the final fuel filter element if necessary. Then prime the fuel system until clean fuel reaches the fuel injection pumps. If the fuel system is air bound, priming the system will overcome the difficulty.

When the engine is running irregularly, and smoking, a fuel injection valve may not be spraying the fuel properly.

As the clearance between the plunger and the barrel of a fuel injection pump increases, due to wear, fuel leakage occurs. When the leakage increases to the point where insufficient fuel is injected into the cylinder, a loss of power is noticeable. With the loss of power, hard starting is also encountered.

Fuel Injection Valves

Testing Fuel Injection Valves: Whenever an engine performs in such a manner that a fuel injection valve is suspected of causing trouble, test all fuel injection valves. To test the injection valves loosen the fuel injection line nuts at the fuel injection pumps, one at a time, while the engine is running. When a nut is loosened and the exhaust smoking is completely or partially eliminated and the irregularity in running is not affected, this identifies the probable location of a defective valve and a new one should be installed in that cylinder to definitely determine if the valve removed was defective.

Never wire brush or scrape a fuel injection valve nozzle assembly as this will damage the finely machined orifice.

Removing Fuel Injection Valves: Before removing a valve clean the dirt from around the valve and connections. If equipped with glow plugs see the topic, GLOW PLUGS.

LOOSENING FUEL INJECTION LINE NUT TO TEST VALVE

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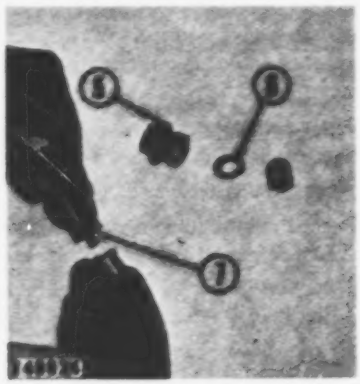
Loosen the fuel injection line at the pump and disconnect it from the valve. Immediately install the plug **(4)** to prevent dirt from entering the fuel injection line. Remove the valve retainer nut **(2)** and lift out the fuel injection nozzle assembly **(3)** and fuel valve body as a unit. If the fuel injection valve will not be immediately installed, the cap **(1)** should be put on the valve body to prevent dirt from entering the valve body and valve nozzle.

REMOVING FUEL INJECTION VALVE

1–Cap. 2–Retainer nut. 3–Fuel injection valve nozzle assembly. 4–Plug.



INSTALLING FUEL INJECTION VALVE

5–Large seal. 6–Small seal. 7–Injection valve body.

Installing Fuel Injection Valves: Before installation of a fuel injection valve, be sure the wrench is clean. Put the dust cover on the valve body as soon as possible to prevent dirt entering the fuel passage. Install the fuel injection valve in the following manner:

1. Screw the valve body **(7)** into the fuel injection valve nozzle assembly only finger tight. The threads of the body and nozzle assembly are made to fit loosely. The clearance between the threads provides a passage for fuel to enter the nozzle assembly from the body.

2. Insert the nozzle assembly and valve body as a unit into the precombustion chamber opening. Turning the body in a clockwise direction and at the same time pressing down will assure alignment of the serrations.

3. Install a new large seal **(5)** on the retainer nut. A light coating of lubricant on the seal will permit it to seat properly.

4. Tighten the retainer nut to a torque of 100 to 110 pounds feet to prevent leaks between the nozzle assembly and the nozzle assembly seats.

5. Place a new small seal **(6)** over the threads on the top of the valve body and on the retainer nut.

6. Connect the fuel injection line and tighten the nuts.

Fuel Injection Pumps

Testing Fuel Injection Pumps: It is not usual for one pump on an engine to require replacement unless all the pumps are worn. Worn fuel injection pumps will result in loss of power and hard starting. When loss of power and hard starting is accompanied with a clear exhaust, good compression and no blow-by gases from the crankcase breather, it indicates fuel injection pumps may be worn.

COOLING SYSTEM

Coolants: Water used in the cooling system should be soft, or as free as possible from scale forming minerals. It is advisable to treat the available water with Rust Inhibitor. The use of this rust inhibitor in the cooling system will prevent the formation of rust. It will also retard, and in some cases completely eliminate mineral deposits within the engine. Most commercial anti-freeze solutions contain rust inhibitors, therefore, it is not necessary to use rust inhibitors with those anti-freeze solutions which do contain inhibitors.

When the temperature is below freezing sufficient anti-freeze should be used in the cooling system to prevent freezing. Various anti-freeze mixtures such as ethylene glycol, denatured ethyl alcohol, methanol (synthetic wood or methyl alcohol) and glycerine are all suitable for use. Alcohol can be used successfully but, because it readily evaporates at the normal operating temperature of the diesel engine the solution should be tested frequently — even daily — and kept up to correct strength. This loss by evaporation is objectionable **but the temperature regulator should not be removed.** Doing so might make the solution run cooler and save the alcohol, but is not desirable for good performance. It is essential, therefore, that the coolant be tested frequently to assure adequate protection.

Draining: The cooling system is drained by opening the radiator drain valve **(1)** on the left side of the radiator bottom tank and removing the plugs from the diesel engine block at **(2),**

This will drain the entire diesel engine cooling

COOLING SYSTEM DRAINS
1–Radiator drain valve. 2–Diesel engine block drain plug.

system, if the tractor is level. When equipped with direct electric starting, open radiator drain valve (1) and remove diesel engine block drain plug (2) to drain the entire diesel engine cooling system, if machine is level.

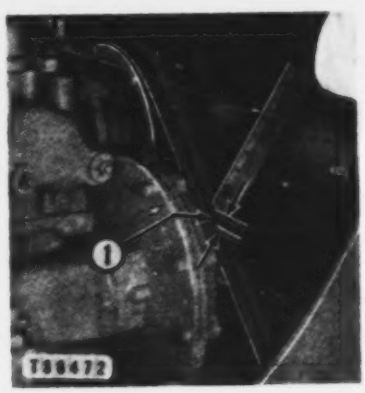
Cleaning The Radiator: Every 10 service hours clean dirt and trash from in between the tubes of the radiator which may cause an excessively high operating temperature. Wash, brush or blow the dirt out with whichever method is available and most effective.

Cleaning The Cooling System: An occasional washing of the cooling system may be necessary to remove the dirt and sediment which accumulates. The frenquency of washing will depend on the amount of foreign material present in the water used in the system.

To wash the system run the engine until the liquid in the cooling system is at operating temperature, and the loose foreign material is stirred up. Then stop the engine, and drain as quickly as possible before the sediment has time to settle. Close the drain and pour in kerosene equal to about one-tenth the capacity of the cooling system and fill the remainder with a solution of one-half pound (226.8 grams) of washing soda to each gallon (3.8 liters or .8 Imp. Gal.) of water. Run the engine for about one-half hour, and again drain and flush the system with clean water. Commercially available cooling system cleaners may be used.

FAN BELT ADJUSTMENT

The fan belts should be checked every 250 service hours for proper adjustment. If the fan belts are operated too loose, they will slap against the pulleys, causing unnecessary wear to the belts and pulleys and possibly slipping to the extent that the engine will overheat. If the belts are too tight, unnecessary stresses are placed upon the fan bearings and belts, which might shorten the life of both. Correct adjustment exists when the belts can be pushed inward approximately 9/16 to 13/16 inch (1.4 to 2.0 cm.) as shown at **(1)**.



CHECKING FAN BELT TENSION

1–Correct adjustment allows approximately 9/16 to 13/16 inch (1.4 to 2.0 cm.) slack at this point.

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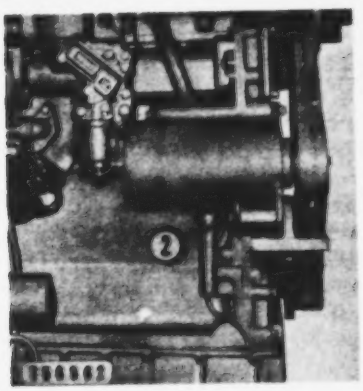
When a belt (or belts) need replacing, a matched set should be used. Always install a matched set — never only one.



(Tractors With Generators)

FAN BELT ADJUSTMENT

2–Retaining nuts or bolt.

Adjusting Belts On Tractors With Generators: To adjust the fan belt tension, loosen the retaining bolt **(2)**. Move the generator against the belts to obtain the correct belt tension. The adjustment is correct when the belts can easily be pushed inward a distance of 9/16 to 13/16 inch (1.4 to 2.0 cm.) when measured at **(1)** with approximately 25 pounds pressure exerted midway between the pulleys. Check the adjustment after tightening the generator bolts.

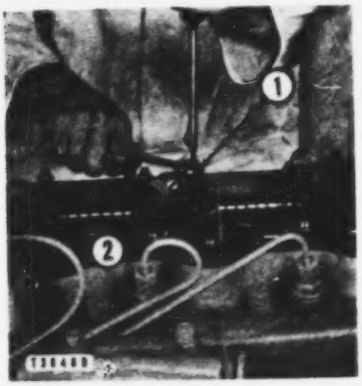
DIESEL ENGINE VALVE CLEARANCE ADJUSTMENT

The initial valve clearance adjustment should be made after the first 100 to 125 service hours of operation. Thereafter, the clearances should be checked and adjusted if necessary after every 500 service hour operating interval.

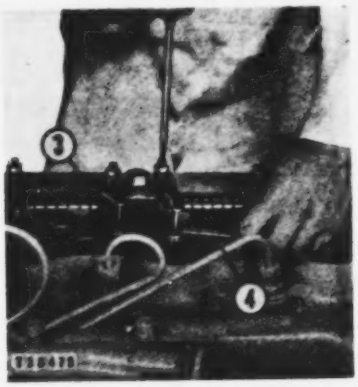
The valve clearance adjustment should be made while the engine is hot, either while the engine is running or before it has been stopped twenty minutes after having run long enough to thoroughly warm up. If the adjustment with the engine stopped is not completed during the twenty minute interval, start the engine and allow it to warm up. The

valve clearance adjustment must be made or the clearances checked, with the compression release lever in the run position.

To Adjust: Loosen the valve adjusting screw locknut **(1)**, turn the adjusting screw **(2)** to allow a thickness gauge **(4)** to pass between the top of the valve stem **(3)** and the end of the valve rocker at the correct clearance. Set this clearance at .015 inch (.381 mm.) for inlet and .025 inch (.64 mm.) for exhaust valves. Tighten the adjusting screw locknut and check the adjustment.



LOOSENING LOCKNUT
1–Locknut. 2–Adjusting screw.



ADJUSTING VALVE CLEARANCE
3–Valve stem. 4–Thickness gauge.

If the adjustment is made with the engine stopped, turn the engine until the valve closes and push rod is at its lowest point.

The compression release clearance is not adjustable but it should be checked when the valve clearances are checked. The normal clearance between the inlet valve rocker and flat of the compression release shaft is about .060 inch (approximately .15 cm.).

FLYWHEEL CLUTCH

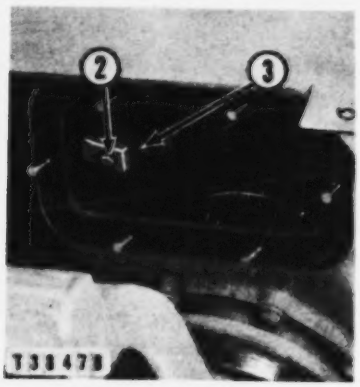
The proper clutch adjustment will give a clutch lever pull of approximately 55 pounds. This measurement is made with a spring scale placed at the bottom of the handle on the clutch control lever with the engine stopped and when the clutch is cold. Slightly higher pounds pull may be required when the clutch is warm. Clutch lever pull will reduce when the engine is running, but when the clutch is properly adjusted the lever

should go into engaged position with a distinct snap. The clutch adjustment should be checked every 500 service hours and adjusted if necessary.

To Adjust: When clutch adjustment becomes necessary proceed as follows:

1. Remove the clutch inspection floor plate center section. Care should be exercised to clean any dust or dirt from the top and around edges of the clutch compartment cover **(1)**. Be sure all tools used to make the adjustment are clean. Remove the cover being careful not to damage the gasket under the cover.

CLUTCH ADJUSTMENT
1–Cover.



ADJUSTING CLUTCH
2–Locknuts. 3–Adjusting ring.

2. Turn flywheel until one of the adjustment locknuts **(2)** is accessible. Loosen locknut about two turns. Tap plate slightly to be sure it is free on stud. Rotate flywheel 180° and loosen the other locknut in same manner.

3. Turn the adjusting ring **(3)** clockwise to tighten.

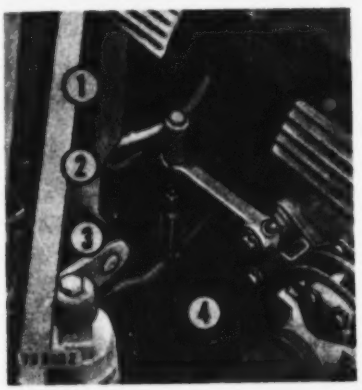
4. Tighten the locknuts to a torque of approximately 30 pounds feet. This can be accomplished with a steady pull on the end of a 9/16 socket wrench.

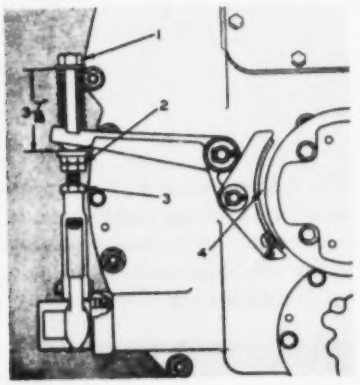
5. Check to see that the clutch compartment cover is clean and the gasket is in good condition, then install the cover.

Clutch Brake Adjustment: The tractor is equipped with a clutch brake, which stops the clutch shaft from turning, and permits shifting gears without clashing. To apply the brake, press the flywheel clutch control lever forward as far as it will go. If the clutch shaft is slow in stopping, the clutch brake should be adjusted.

To Adjust: If the brake has become worn and adjustment becomes necessary proceed in the following manner:

1. Loosen the clutch brake adjustment locknut **(3)**.
2. Push clutch control lever all the way forward.
3. Hold the clutch control lever in this position and turn the adjusting bolt **(1)** so that the brake lining touches the brake drum evenly. Turn the adjusting bolt **(1)** in (clockwise) to decrease clearance at **(4)** between the brake lining and the brake drum or out (counter-clockwise) to increase clearance.
4. Release the flywheel clutch control lever and turn the adjusting bolt in (clockwise) 2 turns.
5. Tighten the locknut.
6. Locknuts **(2)** are preset and should not be altered unless the 3 7/16 inch dimension shown is incorrect when the clutch is engaged.





CLUTCH BRAKE ADJUSTMENT
1–Adjusting bolt. 2–Locknuts. 3–Clutch brake adjustment locknut. 4–Clearance at this point.

NOTE

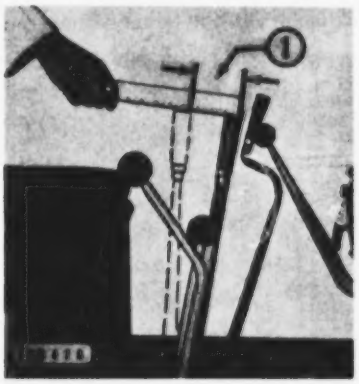
If brake is adjusted too tight the brake will be applied before the clutch is fully released and difficult shifting and high clutch brake lining wear will result.

STEERING CLUTCHES AND BRAKES

The steering clutches should be kept in proper adjustment to insure full engagement of the clutches when the levers are in the free forward position. Obstructions such as rocks, sticks and the like which hinder the

control levers traveling to the free forward position should be removed. If the tractor is operated with improper steering clutch adjustment or with obstructions to the control levers the release bearings may become damaged.

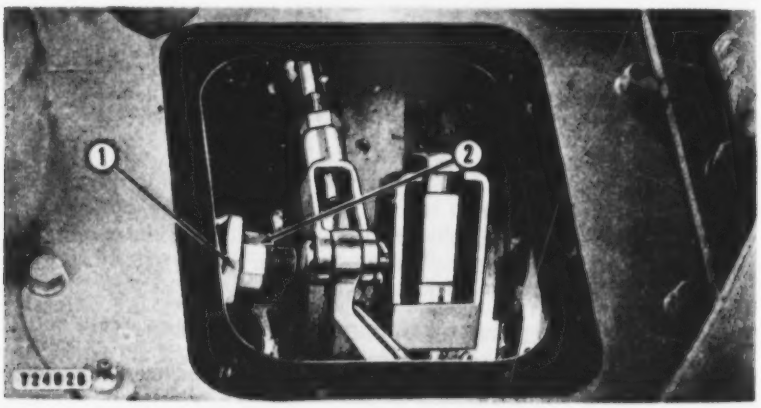
Steering Clutch Adjustment: When the steering clutch levers have 3¾ inches (9.9 cm.) free movement at **(1)**, the clutch adjustment is correct. This free movement reduces as the clutch facings wear and adjustment becomes necessary.



CHECKING STEERING CLUTCH CONTROL LEVER FREE MOVEMENT

1–There should be 3¾ inches (9.9 cm.) free movement at this point.

To Adjust: Remove the inspection plate (one for each clutch) from the top of the steering clutch case. With the engine stopped or the flywheel clutch disengaged loosen the locknut **(2)** and turn the adjusting nut **(1)** on the adjusting screw until the correct free movement is obtained at the top of the steering clutch control levers. Then retighten the locknut.



STEERING CLUTCH CONTROL ADJUSTMENT
1–Adjusting nut. 2–Locknut.

As the steering clutches become sufficiently worn through service to prevent restoring proper control adjustment.

Steering Clutch Brake Adjustment: Keep the brakes adjusted just tight enough so the tractor will turn correctly when the steering clutch is released and the pedal is depressed between 3½ to 4½ inches (8.89 to 11.45 cm.). When the right brake is fully applied the brake lock latch should engage with the notches on the ratchet to lock the pedal. The band should be entirely free from the drum when the pedal is in the released position.

STEERING CLUTCH BRAKE ADJUSTMENT

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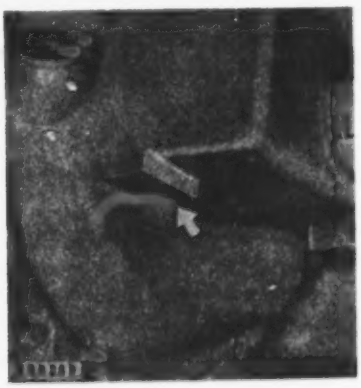
To Adjust: Remove the inspection plate located on either side near the back of the seat and on top of the steering clutch case. Turn the head of the adjusting nut in a clockwise direction to tighten the brakes. Loosen the locknut **(2)** on the support screw **(1)** on the underside of the

ADJUSTING BRAKE SUPPORT SCREW

1–Support screw. 2–Locknut.



STEERING CLUTCH COMPARTMENT DRAIN PLUGS

steering clutch case below the brake drum. Apply the brake to draw the brake band tightly around the drum. Turn the support screw up tight against the band then back off 1½ turns and tighten the locknut. This screw supports the brake band and maintains the correct clearance between the lining and the drum.

Draining Steering Clutch Compartment: The steering clutches are designed to operate dry. **Any seepage from the adjoining compartments should be drained every 50 service hours of operation by removing the plugs in the bottom of the case.** Failure to observe proper draining periods may result in the clutches slipping or difficulty in steering the tractor. The drain plugs should be replaced to keep out dirt and moisture during operation.

Washing The Steering Clutch Brakes: If the steering clutch compartments have not been drained at the proper interval or lubricant has accumulated on the steering clutch brakes sufficiently to cause slippage or difficult steering, some improvement in operation will result by washing the brakes. To do this proceed as follows:

1. Drain the compartments and replace the drain plugs.
2. Remove the brake adjustment covers and pour enough **non-inflammable** cleaning fluid into each compartment so that each steering clutch brake drum will dip into the fluid.

WARNING

Washing should be done when the compartments are cool and well ventilated to avoid the possibility of an explosion.

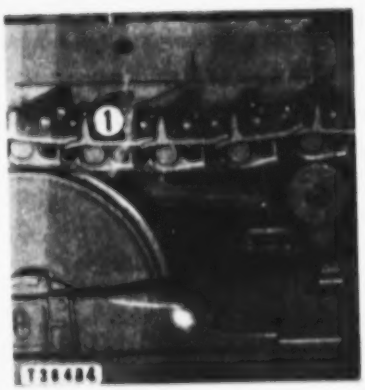
3. Operate the machine back and forth for five minutes without releasing the steering clutches. This will prevent the oil and dirt on the outside of the clutches and the inside of the cases from being washed in between the clutch discs.
4. Drain the compartments.
5. Repeat the washing procedure, this time applying the brakes occasionally.
6. Drain the compartments and replace the drain plugs.
7. Lubricate the steering clutch release bearings.

TRACK ADJUSTMENT

Proper care of the tracks, especially when operating the machine under adverse conditions, will greatly extend their service life.

After operating in mud or slush and below freezing temperatures are anticipated, park the machine on solid dry ground, planks, logs or brush to prevent the machine from freezing to the ground. Snow or mud should also be cleaned from around the track links, sprockets, idlers, rollers and guards to prevent freezing of the tracks.

The tracks should be operated without tension to avoid undue wear of moving parts. When properly adjusted, there should be no less than 1 to 1½ inches (2.5 to 3.8 cm.) slack measured at a point half way between the carrier roller and the front idler as shown at **(1)**. Looser adjustments may be required to prevent tension on the tracks when operating in material which will pack around the track parts and between pins and bushings.



CHECKING TRACK ADJUSTMENT

1–There should be 1 to 1½ inches (2.5 to 3.8 cm.) sag at this point.

◆

Hydraulic Type

As continued track adjustment becomes necessary through service, the following precaution should be observed. Do not attempt to make an adjustment if the minimum measurement at **(2)** is less than ⅛ inch (.32 cm.) after the adjustment is made when the tractor is equipped with hydraulic track adjusters.

TRACKS

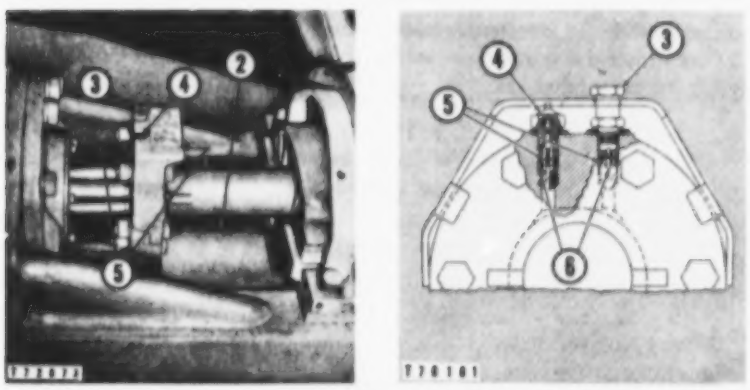
This information applies to the hydraulic track adjuster which has the ball check construction and a slotted protective guard welded to the idler rod flange.

To Adjust:

If the slack or sag in the track is greater than 1½ inches (3.8 cm.), proper adjustment can be obtained by proceeding as follows:

1. Raise the inspection plate on the track roller frame guard or remove the guard on models that do not have an inspection plate.
2. Apply ball and roller bearing lubricant, with a grease gun, into the fill valve **(4)** until the track is at the correct adjustment.
3. Operate the machine backward and forward to equalize the adjustment.
4. Recheck the adjustment.

The limiting measurement of track adjustment **(2)**, which has been previously established for hydraulic track adjusters and is shown in the Operation and Maintenance Instructions for the particular model concerned, remains the same for this ball check type hydraulic track adjuster.



ADJUSTING TRACK WITH BALL CHECK TYPE HYDRAULIC TRACK ADJUSTER
(Guard removed from D8 Tractor for illustration purposes.)
2–Limit of track adjustment. 3–Relief valve. 4–Fill valve. 5–Vent holes. 6–Slot in lower section of thread.

To Loosen Track Adjustment:

If the track is too tight, release some of the pressure in the hydraulic track adjuster cylinder, with caution, as given in the following steps:

1. Remove all dirt, sticks or other debris that may prevent retraction of front idler.

NOTE

Because of the high pressure in the track adjuster cylinder, never visually inspect the relief valve **(3)** or the fill valve **(4)** to see if grease is escaping. Always observe the track to see if it has loosened.

2. Turn the relief valve **(3)** one turn counterclockwise and allow grease to escape from vent hole **(5)** just below the relief valve.
3. Tighten the relief valve when more than 1½ inches (3.8 cm.) slack or sag has developed in the track.

Adjust to obtain correct slack or sag in the track.

If the track does not loosen in the above procedure, proceed as follows, in order, as needed.

1. Turn the fill valve **(4)** one turn counterclockwise and allow grease to escape from vent hole **(5)** just below the fill valve.
2. Start the machine and move backward and forward slightly.
3. Loosen the relief valve until the lower hexagonal shoulder contacts the underneath side of the guard. This will expose the unthreaded portion between the upper and lower threaded sections of the relief valve, allowing grease to escape through the slot **(6)** in the lower section of threads.
4. Loosen the fill valve until the hexagonal shoulder contacts the underneath side of the guard. This will expose the unthreaded portion between the upper and lower section of the fill valve, allowing grease to escape through the slot **(6)** in the lower section of threads.
5. Tighten the relief valve and/or fill valve when more than 1½ inches (3.8 cm.) slack or sag has developed in the track.

Adjust to obtain the correct slack or sag in the track.

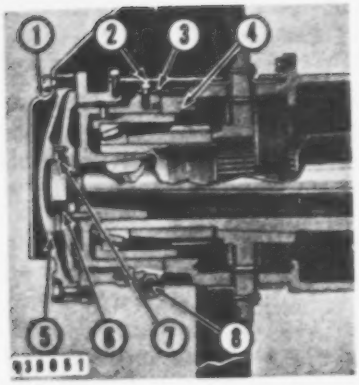
FINAL DRIVE SPROCKET HUB BEARINGS

During the initial operation of the tractor the sprocket hub bearings are likely to require some adjustment. By maintaining the proper adjustment bearing life can be increased. They should be checked on a new tractor and adjusted if necessary after the first 125 service hours of operation, another check or two at 125 service hour intervals is suggested but thereafter every 1000 service hours should be sufficient. If leakage of lubricant is noticed around the sprocket hub on a new tractor before 125 service hours of operation an adjustment of the bearing may stop the leak.

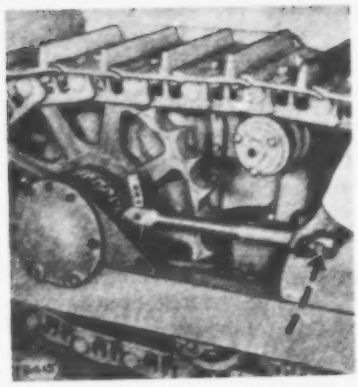
To check the bearing adjustment, place a four or five foot bar between the track roller frame and the sprocket. If any looseness in the sprocket hub bearings is noticed when prying with the bar, adjustment is necessary. This checking should be made when there are no objects under the track which might put the tractor weight on the sprocket.

To Adjust:

1. Remove the guard plates **(1)** and **(2)** from the track roller frame outer bearing and remove nut and lock from the clamp bolt **(8)** at the bottom of the holder assembly. Remove lock **(3)** from the notch in the adjusting nut **(4)**.



CROSS-SECTION OF SPROCKET HUB



TIGHTENING SPROCKET HUB BEARINGS

1–Large guard plate. 2–Small guard plate. 3–Lock. 4–Adjusting nut. 5–Cap. 6–Retainer nut. 7–Lock. 8–Clamp bolt.

2. The bearing cage retainer nut **(6)** should also be checked for tightness before making the bearing adjustments. Remove the cap **(5)** and lock **(7)**. Loosen the adjusting nut **(4)** one or two turns by turning it clockwise then tighten the retaining nut by using a five foot extension on the wrench.
3. Tighten the adjusting nut by turning it **counterclockwise**. Use a five foot extension on the wrench to be sure the nut is tight.
4. Install the lock and clamp bolt nut then tighten the clamp bolt and replace the guard plates.
5. Recheck the adjustment.

WASHING GEAR COMPARTMENTS

Washing The Transmission: Remove the drain plugs from the speed change and bevel gear compartments after a run, when the oil is warm. This drains the speed change compartment and the bevel gear compartment. Replace the plug and fill to the proper level with kerosene or some non-inflammable cleaning fluid. Drive the tractor back and forth for five minutes, if it is convenient. If not, start the engine and put the gears in the highest speed. Tie back the steering clutch levers and engage the flywheel clutch. Allow the gears to run five minutes, disengage the clutch, and shift into neutral. Drain the cleaning fluid and refill with fresh lubricant to the correct level as instructed in the **LUBRICATION ORDER.**

Washing The Final Drive Cases: Remove the drain plugs from both cases after a run when the oil is warm and allow the old oil to drain. Replace the plugs and fill the cases to the level of the filler hole with kerosene or some non-inflammable cleaning fluid. Drive the tractor back and forth for five minutes and remove the drain plugs. After all the washing fluid has drained, replace the plugs and fill to the correct level with fresh lubricant.

ELECTRICAL SYSTEM

The basic electrical system is composed of the following:

1. Battery.
2. Generator.
3. Generator regulator.
4. Wiring.

These components functioning together produce the electricity for operating the electrical equipment on the machine and each is dependent upon the others for satisfactory operation. In the event of failure or improper operation it is essential to check the entire electrical system, as a defect in one component can cause damage to another.

The topics which follow describe the proper maintenance of the components to assure satisfactory operation of the electrical system.

Battery

Every 50 service hours, or more often when continuous operation without the use of the battery is encountered, the following attention should be given to the battery to insure high efficiency and maximum operating life.

Testing: The battery should be tested with a hydrometer and kept to a specific gravity of 1.250 or above. Always test a battery for degree of charge before adding water. The specific gravity between the cells should be within .025. A dangerously low point of charge is indicated by a hydrometer reading 1.150 which will permit the battery to freeze at temperatures only a few degrees below the freezing point of water. A specific gravity of 1.250 will permit the battery to withstand temperatures as low as —60°F. without freezing.

Water Addition: The electrolyte level should be maintained 3/8 inch (9.5 mm.) above the separators or insulators by addition of distilled water or "approved water" (water free from impurities by analysis). Do not overfill or underfill the cells of the battery as either has a detrimental effect on battery life.

Charging: The charging rate is correct when the battery maintains a minimum specific gravity of 1.250 and does not require the addition of more than 1 ounce of water per cell per week or 50 service hours.

When there is evidence of either overcharging or undercharging, the cause should be found and corrected as soon as possible to protect the service life of the battery. See the topics, GENERATOR, GENERATOR REGULATOR and WIRING.

Cleanliness: Keep the top of the battery clean and dry to prevent current losses and keep the terminals clean and tight. To clean corrosion from the battery terminals, scrub them with a weak solution of bicarbonate of soda (baking soda) and water. Dry the battery thoroughly, then coat the terminals with lubricant to prevent corrosion. Keep the battery securely fastened in its compartment at all times.

Installation: When installing a battery in its compartment, fasten it securely and be sure to attach the cables to the correct battery terminals. Incorrect grounding of the battery will reverse the polarity of the electrical system and cause damage to the generator regulator. See the topic, GENERATOR REGULATOR.

Generator

Never operate a generator with an open circuit between it and the battery.

General Reconditioning: Every 2000 service hours, the generator should be removed and the commutator and brushes checked for glaze or darkening. At the same time the generator should be completely disassembled, washed and have all worn parts replaced.

Generator Removal: Remove all wires from the generator and tag them so that they may be connected correctly when the generator is reinstalled. Remove the bolts or stud nuts that hold the generator in position and lift off the generator.

Generator Installation: Whenever a generator is installed, or reconnected to the generator regulator, it must be polarized **before** starting the engine. Follow the instructions carefully to prevent damage to the generator, generator regulator, or both, due to incorrect polarizing.

1. Place the generator in position and install the bolts or stud nuts.
2. Connect all wires to the generator, regulator and battery. See the topic, WIRING

3. Polarize the generator.

Polarizing Generators: With the disconnect switch ON, if so equipped, connect a jumper wire momentarily between the regulator terminals marked BAT and GEN. Make sure all connections are clean and tight. See the topics, BATTERY, GENERATOR REGULATOR and WIRING.

Generator Regulator

The generator regulator is adjusted at the factory for average operating conditions. The regulator may have to be readjusted to provide the proper charging rate for the particular operating conditions of the machine.

Charging Rate: The normal function of the generator regulator is to adjust the generator charging rate by sensing the degree of charge in the battery. As the battery becomes fully charged, the charging rate should drop until the ammeter indicates a rate only perceptibly above zero.

When improper charging of the battery is encountered, the entire electrical system should be carefully checked. Loose or dirty connections, worn or broken wires, or a faulty generator can prevent a good regulator from functioning properly. See the topics, BATTERY, GENERATOR, and WIRING.

Polarity: Electrical systems may have either the positive or negative battery terminal grounded. When connecting the battery, be sure to ground the same battery terminal that was originally grounded. On new installations or where the battery grounding is questioned, check the generator regulator to determine the polarity of the system. The battery must be grounded as indicated on the regulator or damage will result.

The voltage and polarity of the electrical system are marked either on the cover or on the base of the regulator near a mounting hole. These marks may appear in any of the following forms: "24 VOLTS - NEGATIVE GROUND," "24V - NEG.," or "24V N." Similar marks are used for other voltages and for POSITIVE ground systems.

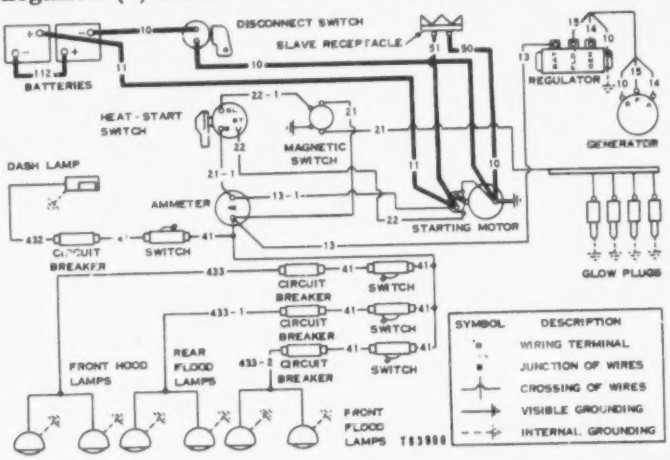
Wiring

The wiring forms an important part of the electrical system and care should be used to protect it from damage. When the electrical system is

being serviced, check the wiring for loose or dirty connections, worn insulation or broken wires. Inspect the battery terminals and cables. Poor connections or wiring can cause trouble or damage in other parts of the electrical system. See the topics, BATTERY, GENERATOR and GENERATOR REGULATOR.

Wiring Diagrams. The diagrams are furnished so that when it becomes necessary to disturb the electrical equipment for purpose of reconditioning or parts replacement, reassembling may be accomplished without difficulty.

The negative (-) terminal of the battery must be grounded.



WIRING DIAGRAM FOR 24 VOLT DIRECT ELECTRIC STARTING

Slave Receptacle: The slave receptacle, located on the lower dash in front of the operator, can be used to charge the tractor batteries or to start the engine from another source in case of battery failure.

To use the slave receptacle, the disconnect switch must be ON. Remove the cap and attach the positive (+) and

SLAVE
RECEPTACLE

negative (-) terminals of a 24 volt direct current source to the positive (+) and negative (-) terminals of the receptacle.

CAUTION

Never connect the terminals in the reverse position as this could cause serious damage to the tractor electrical system.

The disconnect switch must always be turned to the ON position when using the slave receptacle.

ELECTRIC STARTER

24 volt systems

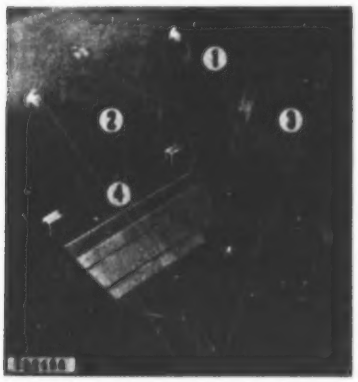
No periodic service is indicated for the electric starter brushes between general reconditioning periods. The brushes should only be inspected after removal of the starter from the engine and removal of the commutator end bearing frame. The 24 volt electric starter commutator end and drive end bearings are equipped with wicks for lubrication purposes. The wicks should be saturated with oil whenever the electric starter is removed or disassembled.

General Reconditioning: Approximately every 4,000 service hours, the starter should be removed so that it may be completely disassembled, washed and have all parts replaced that show evidence of being unsatisfactory for reason of wear. Do not use a degreaser or high temperature cleaning method when cleaning parts of the starter or overrunning clutch. If the overrrunning clutch turns roughly when rotated in the overrunning direction or slips in the cranking direction, after the clutch has been washed, it must be replaced with a new clutch.

SEAT BACK CUSHION ADJUSTMENT

The seat back cushion may be adjusted to two different heights for the operator's comfort. To do this, remove the seat cushion; then remove

the bolts that hold the lower end of fastener strips **(3)** in place. Then lift the seat back cushion off buttons **(2)** located on the fuel tank. Relocate the seat back cushion in the position desired by placing the cushion over



ADJUSTING SEAT BACK CUSHION

1–Adjusting holes. 2–Buttons. 3–Fastener strips. 4–Lugs.

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the buttons. Make certain that the button heads are fastened securely in the adjusting holes **(1)**, then install the bolts that hold the lower end of fastener strips to the lugs **(4)**.

LIGHTING SYSTEM

The lighting system includes front hood and flood lamps, rear flood lamps, and an instrument panel lamp. Each pair of lamps and the panel lamp is controlled by a separate switch on the instrument panel as shown.

LIGHTING SYSTEM

1–INSTRUMENT PANEL LAMP SWITCH. 2–FRONT FLOOD LAMP SWITCH. 3–INSTRUMENT PANEL LAMP. 4–REAR FLOOD LAMP SWITCH. 5–FRONT HOOD LAMP SWITCH.

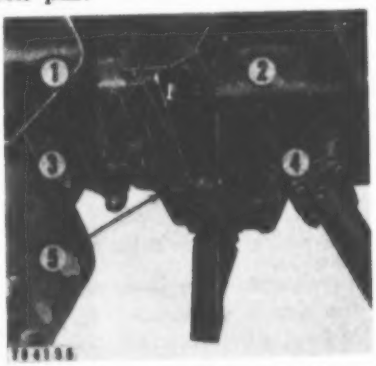
BACK - RIP SCARIFIER

The bulldozer blade is equipped with four back-rip scarifier teeth. Each tooth shank is held in place with a hinge pin which can be installed in either of two holes through the housing. The upper hole is used to store the tooth shank in the retracted position when the scarifier is not being used, and the lower hole is used to place the shank in the operating position.

When the tooth shanks are stored in the retracted position as shown, the scarifier is inoperative. When the tooth shanks are lowered to the operating position, the teeth will perform a ripping action only as the machine moves backward with the bulldozer blade lowered. When the machine moves forward the teeth swing upward and no penetration occurs.

Changing Tooth Shank Position

To change the tooth shank from the retracted position to the operating position, remove the lock pin (1), washer (3), and hinge pin (2). Lower the shank until the hinge pin can be installed through the lower hole (4) in the housing (5), then install the washer and lock pin.

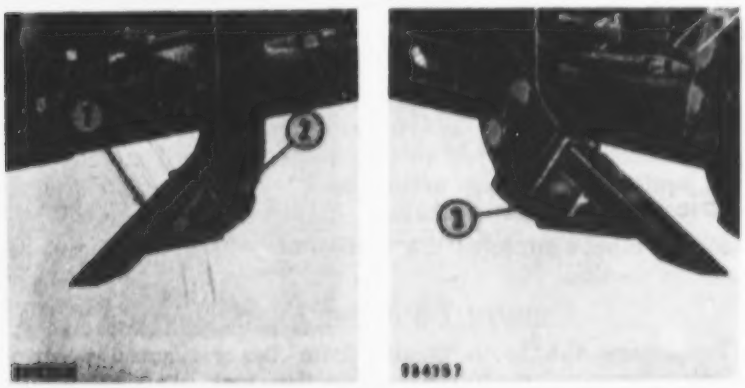


TOOTH SHANK ADJUSTMENT
1-LOCK PIN. 2-HINGE PIN.
3-WASHER. 4-LOWER HOLE.
5-HOUSING.

To change the tooth shank from the operating position to the retracted position, reverse the above procedure.

Scarifier Tooth Tips

The scarifier tooth tips are replaceable. Before removing the retaining washer and pin (3), note the method of crimping the washer so that the new washer can be properly crimped, when installed, to retain the pin.



SCARIFIER TOOTH TIP
1-TIP. 2-HOLE.
3-RETAINING WASHER AND PIN.

To remove the tip (1), insert a punch through the hole (2) and drive out the pin.

To install the tip, position it on the end of the shank with the flat side up and align the holes for the pin. Install the pin and retaining washer, and crimp the washer.

GLOW PLUGS

Maintenance: If it is suspected that the glow plugs are not correctly assisting in starting, the system should be checked for defective glow plugs. The ammeter should be observed when making this check to show that each glow plug uses approximately 5 amperes.

To check, move the HEAT - START switch to the HEAT position. A reading on the ammeter should be approximately equal to the number of glow plugs in the system multiplied by 5. Any reading that varies appreciably from this may indicate one or more defective glow plugs.

To locate the defective glow plug or plugs, check each glow plug separately by removing the leads from the glow plugs one at a time with the

To locate the defective glow plug or plugs, check each glow plug separately by removing the leads from the glow plugs one at a time with the HEAT - START switch in the HEAT position. **Reconnect the lead to the plug before removing the lead from the next glow plug to be checked.** When a lead is removed from a glow plug, with no variation shown on the ammeter, it can be assumed that the plug is defective and should be replaced.

To remove a defective glow plug, disconnect the lead from the glow plug and unscrew the glow plug from the precombustion chamber.

Apply anti-seizure compound to the thread of a new glow plug and install the glow plug into the pre-combustion chamber, tightening it to a torque of from 10 to 12 pounds feet.

GLOW PLUG

The glow plug should first be removed before removing and replacing a fuel injection valve to eliminate the possibility of damaging the glow plug.

FUEL PRIMING PUMP

A priming pump is available for use with direct electric starting and prevents the battery from becoming run down due to excessive cranking when priming the fuel system. To prime the system proceed as follows:

1. Check to see that the diesel fuel line valve is open.
2. Open the vent valve on the fuel filter housing and loosen the fuel injection pump line nuts.
3. Loosen the knob of the fuel priming pump.
4. Operate the pump plunger in and out until the flow of fuel from the vent valve becomes continuous and contains no air bubbles.

FUEL PRIMING PUMP

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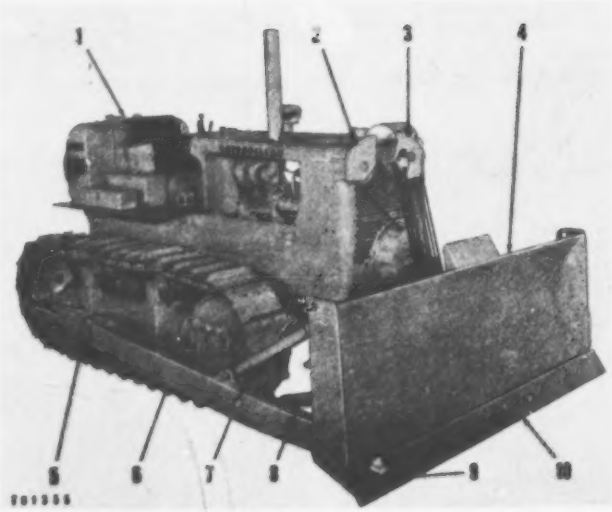
5. Close the vent valve and tighten the line nuts.
6. Tighten the knob of the fuel priming pump to its original position.

PART TWO

CATERPILLAR NO. 6S BULLDOZER

STRAIGHT BLADE CABLE

SERIAL NUMBERS 95E1-UP



NO. 6S BULLDOZER WITH NO. 116 FRONT CABLE CONTROL

1–Cable control lever. 2–Side sheave. 3–Blade lift upper sheave. 4–Bulldozer blade. 5–Trunnion. 6–Push arm. 7–Tilting brace. 8–Diagonal arm. 9–End bit. 10–Cutting edge.

LUBRICATION INSTRUCTIONS

General Lubrication Information

Lubrication Order 5-2410-229-12, which is on the tractor, prescribes the lubrication requirements of the tractor.

Detailed Lubrication Information

Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready to use.

Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrications points after lubricating to prevent accumulation of foreign matter.

Service the lubrication points at proper intervals as illustrated on the lubrication order.

The oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather operation conditions.

Operation Instructions

PREPARATION FOR USE

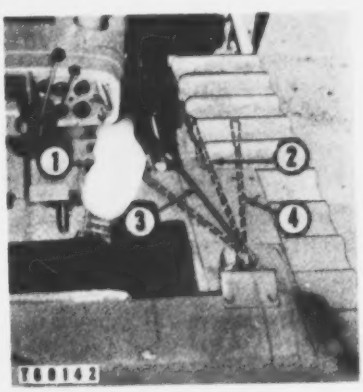
The first duty of anyone charged with the care and operation of a bulldozer is to give it a detailed inspection to see if all bolts, nuts, and pins are tight or properly locked in position. All points should be lubricated as indicated in the lubrication order.

BULLDOZER OPERATION

Cable Bulldozer: The bulldozer is operated by a front cable control. The control lever is located to the right of the operator's seat. When the tractor engine is running the front cable control is always ready to operate.

Engage the clutch with a quick full movement of the control lever in order to avoid clutch slippage and overheating. Release the brake with a short movement of the lever. Let the lever return to the "neutral" position at the instant the blade is in the desired position in order to avoid excess slack and fouling of the cable.

Raise the blade by pulling the lever toward the operator to the raise position (1).



(Front Cable Control)
CABLE CONTROL LEVER POSITIONS
1–Raise. 2–Lower. 3–Hold. 4–Lockout.

Hold the blade in any position by releasing the lever allowing it to return to the neutral or hold position **(3)**.

Lower the blade by releasing the brake, pushing the lever away from the operator to the lower position **(2)**

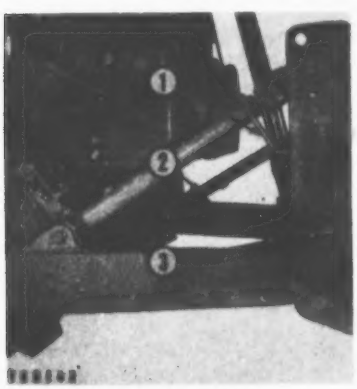
Lockout position **(4)** is obtained by pushing the control lever away from the operator through the brake released position. At this point, a noticeable resistance will be felt on the lever. Continue to push the control lever to the lockout position where it will remain until it is pulled back and released to return to the hold position. With the lever pushed to the extreme right and snapped into the lockout position **(4)** the cable control cable drum may be turned by hand in either direction.

OPERATING ADJUSTMENTS

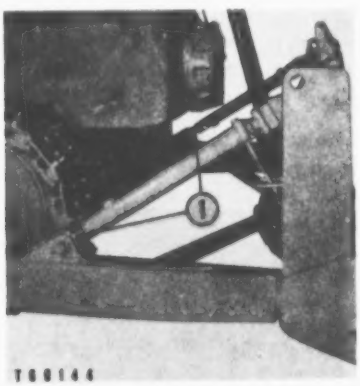
Blade adjustments on cable and hydraulic are the same and all reference to one will apply to the other.

All adjustments should be made with the blade raised

Blade Tilting: The blade may be tilted up to 14.5 inches (66.8 cm.). To make the adjustments, shorten the brace **(2)** on one side and lengthen the other brace **(3)**. The side of the short brace will be the low side. To change the length of the brace use the handle **(1)**.



BLADE TILTING
1–Handle. 2–Shortened brace. 3–Lengthened brace.



TIPPING TOP OF BLADE FORWARD
1–Braces lengthened to tip blade forward.

Blade Tipping: Tipping the top of the blade forward decreases the digging angle. To tip the blade forward or decrease the digging angle, lengthen both blade tilting braces or increase the space as at **(1)**. To tip the blade back, shorten both blade tilting braces or decrease the space at **(1)**. Do not expose any of the threads on the tilting brace eye bolts.

For normal level blade operation, the measurement between the shoulder on the adjusting screw and the end of the brace tube on each brace should be approximately 1 11/16 inch (4.2 cm.) as shown at **(A)**.

A maximum measurement of 5 inches (12.7 cm.) should not be exceeded on either or both braces between the shoulder on the adjusting screw and the end of the brace tube. Exceeding this measurement will expose threads of the adjusting screw subjecting them to damage.

TILTING BRACE ADJUSTMENT

A–Point of measurement to indicate normal (or maximum) blade setting.

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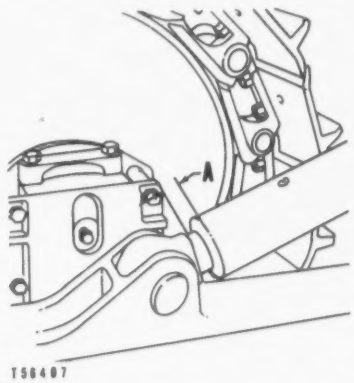


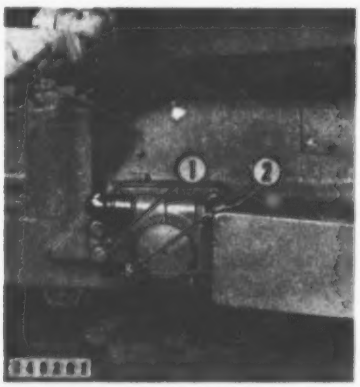
Maintenance Instructions

Caterpillar Bulldozers are constructed so that very few adjustments are necessary. If they are properly maintained they will give an unlimited amount of trouble free service. Maintenance of the ball and socket joints, replacement of cutting edge and end bits,

cable and sheave replacement will be covered in the following topics.

TRUNNION PLATE

The trunnion plate bolts **(1)** and bearing cap bolts **(2)** should be inspected frequently and kept tight. Under hard working conditions this will safeguard against broken bolts.



TIGHTENING TRUNNION BEARING BOLTS AND PLATE BOLTS

1–Plate bolts. 2–Bearing cap bolt.

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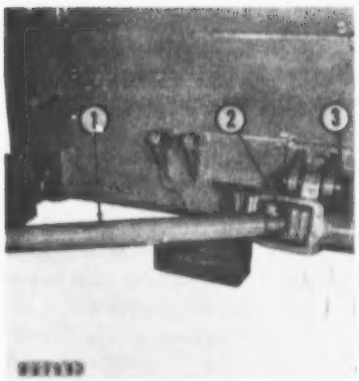
TORSION BAR

The torsion bar bulldozer arrangement has two design differences that are immediately apparent.

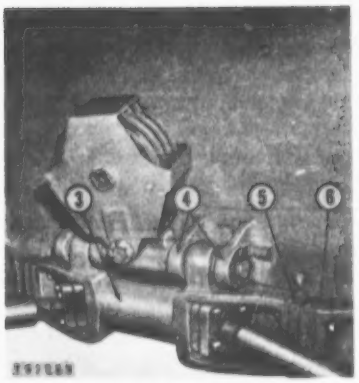
1. The diagonal arms **(1)** are connected to the push arms as before, and are connected through a ball and socket joint **(2)** to the torsion bar **(3)**, rather than directly to the bulldozer.
2. The torsion bar **(3)** is hinged to the blade on brackets **(4)** and is free to swing on two pinned connections.

The wear plates **(5)** fastened to each end of the torsion bar **(3)** are not expected to wear appreciably, however, if wear does occur, they can be replaced or a shim **(6)** added under the wear plate fastened to the bulldozer bracket.

When installing shims or wear plates make sure they are cleaned of all protective coating and remove any nicks or burrs from the shims. When installing the wear plates, tighten the bolts to a torque of 280 pounds feet.



DIAGONAL ARM CONNECTION
1–Diagonal arm. 2–Diagonal arm ball and socket. 3–Torsion bar.



TORSION BAR-CABLE BULLDOZERS
3–Torsion bar. 4–Blade bracket. 5–Wear plate. 6–Wear plate shims.

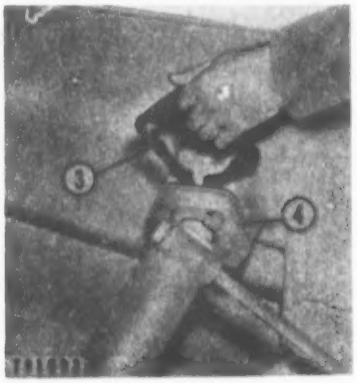
BALL AND SOCKET

Adjustment of the ball and socket joints of the tilt braces and diagonal arms should be made when looseness affects operation.

Push Arm Ball and Socket: The front end of the push arms are fastened to the bulldozer blade with a ball and socket arrangement. There are no shims under the bearing cap and a self locking nut is used on the bolts to securely hold the bearing cap in place. Tighten these nuts to a torque of 230 ± 20 pounds feet.

Tilting Brace Shim Adjustment: Remove the shims from the ball and socket joint of tilting brace **(1)** by removing bolts holding the socket cap in place. Then tilt the blade forward with the brace on the opposite side until the ball clears the edge of the socket.

BALL AND SOCKET ADJUSTMENT
1–Tilting brace. 2–Diagonal arm.



MEASURING SPACE BETWEEN SOCKET AND SOCKET CAP
3–Shims. 4–Tilting brace socket cap.

Clean the shims, ball and socket and lubricate them with ball and roller bearing lubricant. Assemble socket cap **(4)** on the socket without shims **(3)** and tighten the bolts evenly on the cap. Measure the existing clearance with the shims. When the number of shims has been determined add one shim to provide clearance. Remove the cap and install the shims.

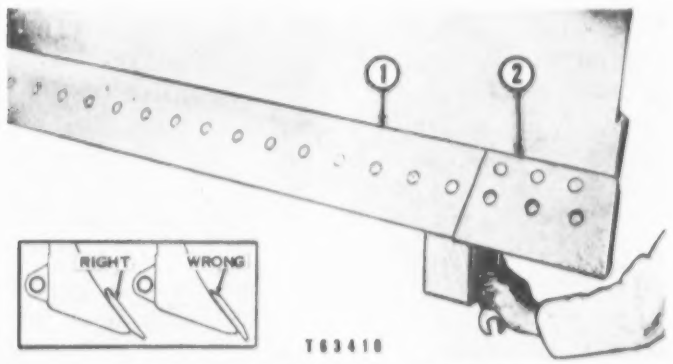
Tighten the bolts of the tilt brace socket caps to a torque of 280 ±25 pounds feet.

Diagonal Arm Shim Adjustment: The diagonal arm **(2)** shim adjustment for the torsion bar bulldozer is made the same as previously described for the tilting brace. Before adjusting the diagonal arm remove the pin that holds the arm to the push arm. This will permit the ball to move in the socket freely and a correct adjustment to be made. There is no adjustment required to align the holes at the push arm end of the diagonal arm. Alignment is accomplished by moving the push arms in or out slightly until the pin will drop in the hole. **Do not adjust the diagonal arms with the pins in place.** To do so may cause high stresses on the push arms during operation because of improper adjustment.

Tighten the bolts on the diagonal arm socket caps to a torque of 280 ±25 pounds feet.

CUTTING EDGE AND END BIT REPLACEMENT

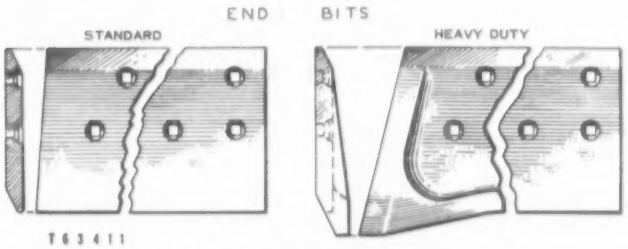
Raise the blade high enough to be able to conveniently reach the nuts on the blade base with a wrench. Block up under the side arms to prevent the blade from dropping in case the control should be accidentally released. Remove the bolts that hold the cutting edge **(1)** or end bits **(2)** to the blade. Turn the cutting edge end for end if it is worn on only one edge. The end bits are not reversible.



REMOVAL OF CUTTING EDGE AND END BITS
1–Cutting edge. 2–End bit.

Before installing the cutting edge or end bits clean the contacting surfaces. Install the bevel on the top edge of the cutting edge to the rear. Install the bolts and tighten the nuts. After several hours of operation again tighten the nuts.

The construction and material used in standard end bits is suitable for normal bulldozing operations. When working in rock, pioneering new roads and other severe operations, heavy duty end bits should be used. The end bits are illustrated to show the differences in construction.



COMPARISON OF END BITS

CABLE REPLACEMENT

Cable will wear faster on the drum end than on the dead end. Because of this, more service can be obtained by reversing the cable. Remove the cable when the drum end shows signs of wear. Fasten the end which was originally the dead end to the cable control drum and rethread the cable as it was originally.

Cable Replacement: It will be necessary to install new cable from time to time. The cable specifications are as follows:

The cable recommended is: 1/2 inch, 6 x 25 filler wire, right Lang lay, independent wire rope center (IWRC), pre-formed improved plow steel type. The length of cable necessary to obtain extreme operations is given in the CABLE INFORMATION CHART.

CABLE INFORMATION CHART

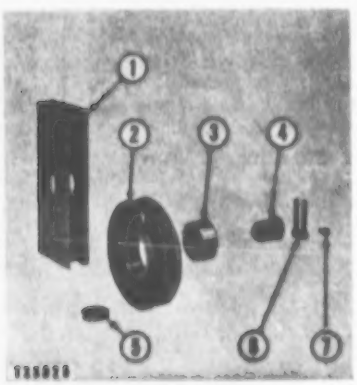
Sheave Arrangement	LENGTH		Size of Cable
	Front Cable Control	Rear Cable Control	
Four part line	40 feet	60 feet	1/2 inch
Six part line	52 feet	72 feet	1/2 inch

Weld each end of the cable to eliminate fraying and simplify threading the cable. **Unroll the cable from the reel, never lift it off in loops.** Fasten one end of the cable to the cable control drum and thread the cable as it was originally.

SHEAVES AND SHEAVE BEARINGS

Sheave bearings **(3)** are the straight roller type and are sealed requiring no adjustment. Sheaves should be checked occasionally for free turning without excessive play, breakage, binding or other damage, to obtain normal cable life.

Sheave shafts are securely retained in sheave block assemblies by the method shown in the illustrations. The retainer **(5)** is tapped to take two bolts **(6)** which go through shaft **(4)** to hold the shaft securely in the sheave block **(1)**. If the sheave **(2)** fails to turn, check for lubrication



TYPICAL SHEAVE ASSEMBLY

1–Sheave block. 2–Sheave. 3–Bearing. 4–Shaft. 5–Retainer. 6–Bolts. 7–Fitting.

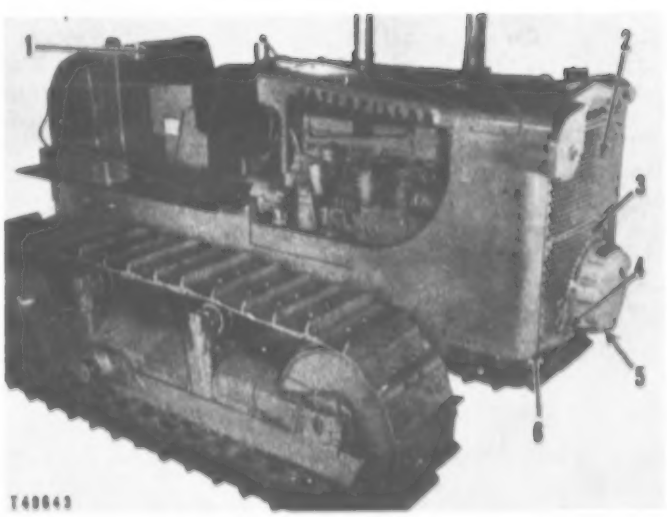
ard damage to the bearing and race. Check the condition of the fitting **(7)** and the lubricant passage in the shaft. If the sealed bearing in the sheave is damaged, press the damaged bearing from the sheave and install a new bearing.

Check the sheave cable grooves occasionally for excessive wear. Replace excessively worn sheaves to prolong cable life.

PART THREE

CATERPILLAR 117 AND 116 CABLE CONTROLS

SERIAL NUMBERS 73F1-UP



117 CABLE CONTROL
(Front Mounted Single Drum on D6B Tractor)
1-Control lever. 2-Radiator upper guard. 3-Radiator lower guard. 4-Cable control gear case filler plug 5-Cable control. 6-Radiator bottom guard.

LUBRICATION INSTRUCTIONS

General Lubrication Information

Lubrication Order 5-2410-229-12, which is on the tractor, prescribes the lubrication requirements of the tractor.

Detailed Lubrication Information

Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready to use.

Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrications points after lubricating to prevent accumulation of foreign matter.

Service the lubrication points at proper intervals as illustrated on the lubrication order.

The oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather operation conditions.

Operation Instructions

PREPARATION FOR USE

The first duty of anyone charged with the care and operation of a cable control is to give it a detailed inspection to see if all bolts, nuts and pins are properly locked in position. All points should be lubricated as indicated in the lubrication order.

OPERATION

The control is driven by the tractor engine through a universal joint which is connected to the fan drive pulley. When the engine is running, all the cable control gears and the driving discs are turning.

The cable is spooled onto the drum when the control lever is moved to the **clutch engaged** position (1). In this position, the engaging mechanism causes the driven discs to contact the driving discs, thereby turning the cable drum.

The cable drum is held by a self energizing brake when the control lever is in the **neutral** position (3).

The cable is unspooled from the drum when the control lever is moved to the **brake released** position (2).

The control lever may be moved to the extreme "brake released" position where it is held in the **lockout** position (4), thereby permitting the drum to be turned by hand in either direction.

Engage the clutch with a quick full movement of the control lever in order to avoid clutch slippage and overheating. Release the brake with a short movement of the lever. Let the lever return to the "neutral" position at the instant the blade is in the desired position in order to avoid excess slack and fouling of the cable.

CONTROL LEVER POSITIONS

1–Clutch engaged position. 2–Brake released position. 3–Neutral. 4–Lockout position.

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DAILY CARE

Attention should be given to the operations mentioned in this topic every 10 hours or daily, whichever occurs first.

A daily check of the cable control should be made to see if there are any loose nuts, bolts, or parts worn to such an extent that they are no longer serviceable. If corrective steps are taken immediately upon discovery of loose or worn parts, fewer forced stops and more economical operation will result.

Dirt should not be allowed to accumulate and pack on the cable control. A few minutes spent daily in keeping it clean are well repaid in greater ease and safety of operation.

Check the clutch and brake adjustment daily and adjust if necessary.

Check the cable daily for excessive wear, kinks and fraying which may result in cable breakage. Excessive slack in the cable may cause it to become kinked. Avoid this as much as possible. Make sure that all the sheaves turn, as the cable will wear more rapidly if one of the sheaves does not turn freely. The cables should be replaced when they show signs of sufficient wear to permit breakage or interference with proper operation. See the topic, CABLE REPLACEMENT.

Maintenance Instructions

The Cable Control has but a few moving parts which, if properly maintained, should give long trouble-free service. Maintenance of the cable, clutch and brakes will be covered in the following topics.

CABLE

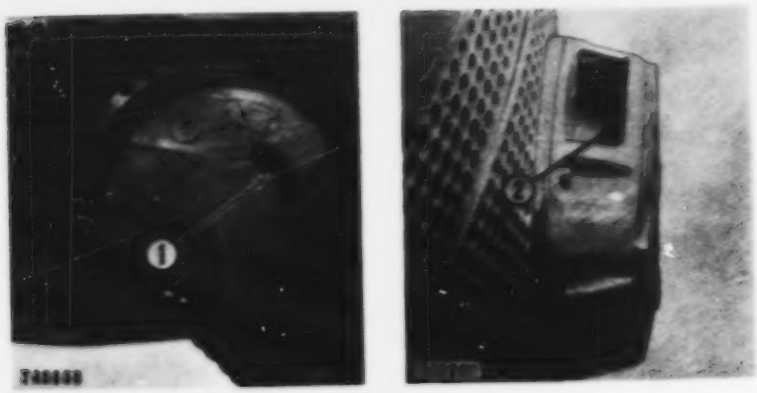
The cable recommended is ½ inch, 6 x 25 filler wire, right lang lay, independent wire rope center, preformed improved plow steel type. Be sure to use the recommended size and type of cable. The entire line of equipment is designed for this particular cable for maximum efficiency, from the contour of the groove in the sheaves to the sheave size, sheave bearings and all working parts.

General Instructions: Approximately 4 wraps of cable should be on the drum for normal operation when the bulldozer is at ground level. However, more cable may be required to operate the bulldozer under some conditions. Excess cable on the drum only tends to become frayed and damaged.

As a safety precaution, **do not attempt cable replacement with the engine running**, since the gears and driving discs of the cable control will always be rotating.

Cable Replacement: Loosen the cable clamping bolt (1) and remove the old cable.

Weld the end of the strands of the new cable together at each end to eliminate fraying and to permit easier threading. **Unroll the cable from the reel, never lift it off in loops.** Push the end of the new cable into hole



CABLE REPLACEMENT
1–Clamping bolt. 2–Hole.

(2) in the cable drum until the end is flush with the opposite opening in the drum.

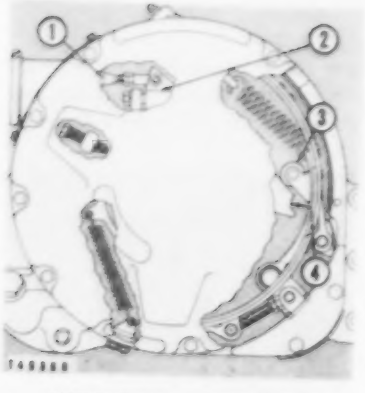
Tighten the cable clamping bolt securely.

ADJUSTMENTS

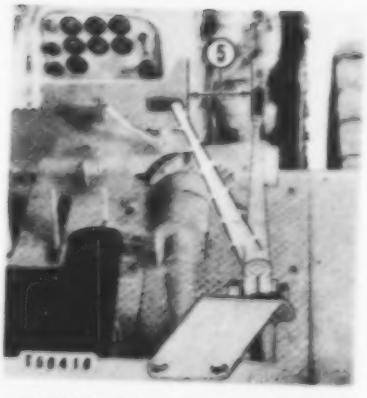
Operation: The clutch and brakes are operated by the operator's control lever through linkage connected to the rod (1). Movement of the operator's control lever to the clutch engaged position moves clamp (2) and engages the clutch. When the operator's control lever is moved to the brake released position or the lockout position, roller (3) moves on clamp (2) to release the brake. In lockout position, roller (3) is held in notch (4) of clamp.

When the clutch and brake are properly adjusted there should be approximately 5½ inches (13.34 cm) free movement of the operator's control lever between **neutral** and **clutch engaged** position as shown at (5). The amount of free movement does not include looseness in linkage due to wear. The amount of free movement may be greater but should never be less than 5½ inches (13.34 cm).

When the free movement of the operator's control lever exceeds 9 inches (22.86 cm) the clutch and brake should be adjusted. The brake should be adjusted first.



CABLE CONTROL OPERATION
1–Rod. 2–Clamp. 3–Roller. 4–Notch.



CONTROL LEVER FREE MOVEMENT
5–Minimum measurement.

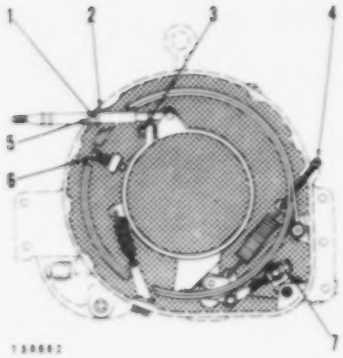
WARNING

Do not adjust the cable control while the engine is running, because clutch engagement is necessary when adjusting the clutch, which could result in serious injury to the operator or damage to the machine.

Cable Controls Effective with 73F387

Brake Adjustment:

1. Remove the brake adjustment cover located at the lower left side of cable control.
2. Tighten adjusting nut **(7)** until mark **(1)** on the control rod is aligned with small hole **(2)**, in the case, at the rear edge of the control rod opening.
3. Install the brake adjustment cover.



BRAKE AND CLUTCH ADJUSTMENT

1–Mark on rod. 2–Small hole in case. 3–Clamp bolt. 4–Adjusting nut. 5–Mark on rod. 6–Lock bolt. 7–Nut.

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Clutch Adjustment:

Adjust the brake as instructed in the topic, BRAKE ADJUSTMENT.

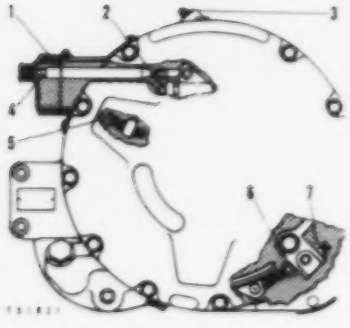
1. With the engine stopped, engage the cable control clutch.
2. Tighten lock bolt **(6)**.
3. Loosen clamp bolt **(3)** and move the control rod until mark **(5)** on the control rod is aligned with small hole **(2)**, in the case, at the rear edge of the control rod opening.
4. Tighten clamp bolt **(3)**.
5. Turn lock bolt **(6)** counterclockwise until the retaining cotter pin and washer contact the boss on the case.

Brake Spring Adjustment: The adjustable brake spring is adjusted at the factory for average operation. It may be necessary to increase or decrease the tension of the spring depending on the requirements of operating conditions. The spring should be adjusted just tight enough so the brake will hold the load without slipping. Adjustment is made by loosening the locknut and tightening the adjusting nut **(4)** tight enough so the brake will hold the load without slipping. Tighten the locknut and check the brake adjustment.

Cable Controls Before 73F387

Brake Adjustment:

1. Remove the brake adjustment cover located at the lower left side of cable control.
2. Remove the dust boot from the housing located on the upper right side of cable control.
3. Loosen locknut **(6)**, tighten adjusting nut **(7)** until mark **(1)** on the control rod is aligned with the outer edge of the housing. Tighten locknut **(6)**. On earlier cable controls the bolt and both jam nuts, located at **(6)**, should be turned as a unit, until mark **(1)** on the control rod is aligned with the outer edge of the housing.



BRAKE AND CLUTCH ADJUSTMENT

1–Mark on control rod. 2–Clamp bolt. 3–Brake spring adjusting nut. 4–Mark on control rod. 5–Lock bolts. 6–Locknut or location of jam nuts on earlier cable controls. 7–Adjusting nut.

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Clutch Adjustment:

Adjust the brake as instructed in the topic, BRAKE ADJUSTMENT.

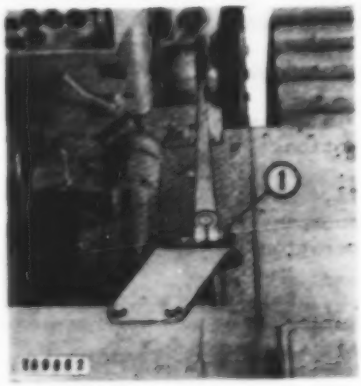
1. With the engine stopped, engage the cable control clutch.
2. Tighten lock bolt **(5)**.
3. Loosen clamp bolt **(2)** and move the rod until mark **(4)** on rod is aligned with outer edge of housing.
4. Tighten clamp bolt **(2)**.
5. Turn lock bolt **(5)** counterclockwise until retaining cotter pin and washer contact the boss on the case.
6. Install dust boot and brake adjustment cover.

Brake Spring Adjustment: The adjustable brake spring is adjusted at the factory for average operation. It may be necessary to increase or decrease the tension of the spring depending on the requirements of operating conditions. The spring should be adjusted just tight enough so the brake will hold the load without slipping. Adjustment is made by loosen

ing the locknut and tightening the adjusting nut (3) tight enough so the brake will hold the load without slipping. Tighten the locknut and check the brake adjustment.

Control Lever Adjustment

To adjust the control lever loosen the clamping bolt (1) and remove the lever from the serrated shaft. Replace the lever in the desired position and tighten the clamping bolt.



CONTROL LEVER ADJUSTMENT
1–Clamping bolt.

WASHING GEAR COMPARTMENTS

Washing The Cable Control Gear Case: Remove the drain plug from the housing when the oil is warm and allow the oil to drain. Replace the drain plug and fill to the proper level with kerosene or clean diesel fuel. Start the diesel engine, and allow it to idle for five minutes to operate the gears and wash the housing. Stop the diesel engine and drain the cleaning fluid. Refill the housing to the proper level.

APPENDIX A

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

A-1. Scope

This appendix lists items which accompany the tractor or are required for installation, operation, or operator's maintenance.

A-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items -- Section II. A list of items which accompany the tractor or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies -- Section III. A listing of maintenance and operating supplies required for initial operation.

A-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column 1:

(1) Source Code, indicates the selection status and source for the listed item. Source code is:

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.

Note. Source Code and level or maintenance are not shown on common hardware items known to be readily available in Army supply channels and through local procurement.

(2) Maintenance Code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability Code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number for the item.

c. Description, Column 3. This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Issue, Column 4. This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit Pack, Column 5. This column indicates the actual quantity contained in the unit pack.

f. Quantity Incorporated in Unit, Column 6. This column indicates the quantity of the item used in the functional group.

g. Quantity Furnished With Equipment, Column 7. This column indicates the quantity of an item furnished with the equipment.

h. Quantity Authorized, Column 8. This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk.

i. Illustration, Column 9. This column is divided as follows:

(1) Figure Number, column 9a. Indicates the figure number of the illustration in which the item is shown.

(2) Item Number, column 9b. Indicates the callout number used to reference the item in the illustration.

A-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies -- Section III

a. Component Application, Column 1. This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number for the item and will be used for requisitioning purposes.

c. Description, Column 3. This column indicates the item and brief description.

d. Quantity Required for Initial Operation, Column 4. This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. Quantity Required for 8 Hours Operation, Column 5. This column indicates the estimated quantities required for an average eight hours of operation.

f. Notes, Column 6. This column indicates informative notes keyed to data appearing in a preceding column.

A-5. Federal Supply Code for Manufacturers

Code	Manufacturer
11083	Caterpillar Tractor Company

SECTION II BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Ref No & Mfr Code / Usable on Code	(4) UNIT OF ISSUE	(5) QTY INC IN UNIT PACK	(6) QTY INC IN UNIT	(7) QTY FURN WITH EQUIP	(8) QTY AUTH	(9) ILLUSTRATION (a) FIG NO.	(9) ILLUSTRATION (b) ITEM NO
		GROUP 31 - BASIC ISSUE ITEMS MANUFACTURED INSTALLED 3100 - Basic Issue Items Manufacturer or Depot Installed							
PC	7510-889-3494	BINDER, LOOSE LEAF: US Army Equipment Logbook NOTE: Initial issue and replenishment of applicable forms will be made in accordance with TM 38-750.	EA	1	1		1		
PC	7520-559-9618	CASE: Maintenance and Operational Manuals, cotton duck, water repellent, mildew resistant	EA	1	1		1		
PC	4210-889-2221	EXTINGUISHER, FIRE: dry chemical hand type, 2 1/2 lb., Fed Spec O-E-915, type III, class 2, size 2 1/2 Walter Kidde P/N 874195 or equal							

SECTION II BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION Ref No & ml Code / Useable on Code	(4) UNIT OF ISSUE	(5) QTY INC IN UNIT PACK	(6) QTY INC IN UNIT	(7) QTY FURN WITH EQUIP	(8) QTY AUTH	(9) ILLUSTRATION (a) FIG NO	(9) ILLUSTRATION (b) ITEM NO
		3100 - Basic Issue Items Manufacturer or Depot Installed (Cont'd)							
C		OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL TM 5-2410-229-12	EA			1	1		
C		LUBRICATION ORDER: LO 5-2410-229-12	EA			1	1		

SECTION III. MAINTENANCE AND OPERATING SUPPLIES

(1) COMPONENT APPLICATION	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) QUANTITY REQUIRED F/ INITIAL OPERATION	(5) QUANTITY REQUIRED F/ 8 HRS OPERATION	(6) NOTES
0101 Crankcase Diesel Engine		Oil Lubricating: 55 Gal Drum as follows: MIL-L-45199A			(1) Includes quantity of oil to fill engine oil system as follows: 25 Qt Crankcase 2 Qt Filters
	9150-680-1104 (2)	HDO-30	27 Qt	(3)	
	9150-680-1105 (2)	HDO-10	27 Qt	(3)	
	9150-242-7605 (2)	OES	27 Qt	(3)	
0306 Tank Fuel		Fuel Oil, Diesel Bulk as follows:			(2) See C9100-IL for additional data and requisitioning procedure.
	9140-286-5294 (2)	DF-2 (Regular)	65 Gal (5)	56 Gal (6)	(3) See current LO for grade application and replenishment intervals
	9140-286-5286 (2)	DF-1 (Winter)	65 Gal (5)	56 Gal (6)	
	9140-286-5283 (2)	DFA (Artic)	65 Gal (5)	56 Gal (6)	(4) Use oil as prescribed in item 1 above
0501 Radiator		Water Anti-Freeze 55 Gal Drum as follows:			(5) Tank Capacity
	6850-664-1409	Anti-Freeze: Ethylene Glycol	11 Gal	(7)	(6) Average Fuel consumption is 7 gal per hour of continuous operations.
Grease Points	9150-190-0905	Grease, Automotive and Artillery 5 LB Can as follows: GAA	5 LB	(3)	

SECTION III. MAINTENANCE AND OPERATING SUPPLIES					
(1) COMPONENT APPLICATION	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) QUANTITY REQUIRED F/ INITIAL OPERATION	(5) QUANTITY REQUIRED F/8 HRS OPERATION	(6) NOTES
	6850-174-1806	Anti-Freeze Compound Artic	11 Gal	(7)	(7) See table for quantities, Ambient Temperature, Specific Gravity and replenishment intervals
0710 Transmission		Oil Lubricating: (4)			
		HDO-30	40 Qt	(3)	
		HDO-10	40 Qt	(3)	
		OES	40 Qt	(3)	
1103 Final Drive		Multipurpose-Type Gear Lubricant			
	9150-597-5841 (2)	GO-90	9½ Qt ea (8)	(3)	(8) 9½ Qts each side
	9150-257-5440 (2)	GOS	9½ Qt ea (8)	(3)	
Power Control Unit		Oil Lubricating (4)			
		HDO-30	1 Qt (1)	(3)	
		HDO-10	1 Qt (1)	(3)	
		OES	1 Qt (1)	(3)	
Hydraulic Steering Clutch		Oil Lubricating (4)			
		HDO-30	5 Qts		
		HDO-10	5 Qts		
		OES	5 Qts		

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

B-2. Explanation of Columns in Section II

a. Group Number. Column 1. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Functional Group. Column 2. This column contains a brief description of the components of each functional group.

c. Maintenance Functions. Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C - Operator or crew

O - Organizational maintenance

F - Direct support maintenance

H - General support maintenance

D - Depot maintenance

The maintenance functions are defined as follows:

A - **INSPECT.** To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B - **TEST.** To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C - **SERVICE.** To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D - **ADJUST.** To rectify to the extent necessary to bring into proper operating range.

E - **ALIGN.** To adjust specified variable elements of an item to bring to optimum performance.

F - **CALIBRATE.** To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G - **INSTALL.** To set up for use in an operational environment such as an emplacement, site, or vehicle.

H - **REPLACE.** To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I - **REPAIR.** To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting and strengthening.

J - OVERHAUL. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K - REBUILD. To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment. Column 4. This column is provided for referencing by code the special tools and test equipment, (Section III) required to perform the maintenance functions (Section II).

e. Remarks. Column 5. This column is provided for referencing by code the remarks (Section IV) pertinent to the maintenance functions.

B-3. Explanation of Columns in Section III

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T & TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Category. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal Stock Number of tools and test equipment.

B-4. Explanation of Columns in Section IV

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II.

The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

SECTION II - MAINTENANCE ALLOCATION CHART

FOR

TRACTOR, FULL TRACKED, LOWSPEED DIESEL DRIVEN, W/BULLDOZER

AIR DROPPABLE (CATERPILLAR MODEL D6 B) FSN 2410-926-0910

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
01	Engine													
0100	Engine Assembly	C	F	C					H			D		A
0101	Crankcase Ay	F							F	F				
	Head Cylinder								F	F				B
0102	Crankshaft													
	Crankshaft Ay	D							D	D		D		C
0103	Flywheel Assembly	O							D	D				C
0104	Pistons, Connecting Rods	D			D	D			D					
0105	Valves, Camshafts, Timing System													
	Camshaft Ay	H							D	D		D		C
	Rocker Arm	F			O				F	H				
	Shaft, Rocker Arm	F							F	H				E

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
0106	Engine Lubrication System													
	Breather, Oil			C					O					
	Cooler, Oil	O							O					
	Filter Assembly, Oil	C		C					C					
	Filler Assembly, Oil			C					O					
	Hoses, Lines	O							O					
	Pan, Oil								F	H				
	Pump Assembly, Oil								D	D				
	Gage, Oil Level	C							C					
	Piston, Oil Regulating	O							O					
0108	Manifolds	O							O					
0111	Driving Mechanism													
	Drive, Assembly								F	F				

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
0111	Driving Mechanism (Cont)													
	Pulley, Fan Drive	O							F					
02	Clutch													
0200	Clutch Assembly	C	O	C	C				F	F				
	Breather and Cover			O					O					
0201	Clutch Disc and Plates	F							F					
0202	Clutch Release Mechanism													
	Yoke, Throw Out Bearing, Shaft, Carrier	F							F					
	Lever, Clutch, Linkage, Bearing, Seal	O							O					
0207	Clutch Brake								F	F				
03	Fuel Injection													
0301	Fuel Injector		O						F	F				

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
0302	Fuel Pumps													
	Injection Pump		O						O	F				
0304	Air Cleaner			C					O	O				
	Element, Air Cleaner			C					C					
0306	Tanks, Lines, Fittings, Tank	C		C						O				
	Cap, Lines, Fittings, Strainer			C					C					
0309	Fuel Filters			C					O	O				
	Filter Assembly			C					O					
	Strainer, Fuel								C					
0311	Engine Starting Aids													
	Lines, Fittings	C							O					
	Glow Plugs	O							O					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
0312	Throttle Controls													
	Throttle								O	O				
	Levers, Rods, Shafts, Bellcranks	O							O					
04	Exhaust System													
0401	Muffler, Pipes, Clamps, and Raincap			C					C					
05	Cooling System													
0501	Radiator	C		C					O	H				
	Cap	C							C					
0502	Grill								O	F				
	Shroud								C	O				
	Guard								O	O				

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G OVERHAUL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
0503	Fittings, Hoses, Clamps	O							O					
	Thermostats		O						C					
	Gaskets	C							C					
0504	Water Pump								O	D				
0505	Fan Assembly													
	Tightener, Belt		C				O	O	F					
	Belts, Fan			C				O						
	Fan, Suction		C				O	O						
	Hub Assembly		C				O	O	F					
06	Electrical System													
0601	Generator	F	C				O	O		D	D			
0602	Regulator, Generator			9			δ							
0603	Starting Motor		C				O			D	D			

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G REPAIR	H REPLACE	Y REPAIR	I OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
0607	Instrument Control Panel Ammeter, Circuit Breaker, Lights, Cables, Switches, and Lamps	O							O					
0608	Miscellaneous Items													
	Receptacle, Slave	O							O					
	Wiring	O								O				
0609	Lights													
	Lamps, Head and Tail								C	O				
	Floodlights								C	O				
0612	Batteries, Storage		O	C					O					
0613	Hull or Chassis Wiring Harness		O						F	O				
0615	Radio Interference Suppression Components								O	O				

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
07	Transmission													
0700	Transmission Assembly			C					F	H	H			
0701	Transmission Shafts									H				
	Bearings, Seals, Gears, Shafts	F							H					
0704	Transmission Top Cover Assembly								F					
	Levers, Shift, Boot, Clamp	O							O					
	Housing, End Yoke, Shafts	O							F					
09	Propeller Shafts			C					O					
0900	Universal Joint			C					O					
11	Rear Axle													
1103	Planetary or Final Drive													
	Final Drive		C					F	H					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
1103	Planetary or Final Drive (Cont)													
	Housing								F	H				
	Final Drive, Gears, Shafts Bearings, Seals	F							H					
13	Tracks													
1301	Suspension Assembly													
	Frame, Track			C						F				
1302	Track Support, Rollers and Brackets													
	Rollers								O	F				
	Brackets									F				
1303	Track Idlers and Brackets													
	Idler, Track								F	F		D		

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
1304	Track Drive Sprockets													
	Sprockets								F			D		
1305	Track Assembly													
	Shoe, Track							O	F	H		D		F
	Pins, Bushings	O							H					
	Track, Assembly			C				O				D		G
14	Steering													
1403	Steering Brakes													
	Pedal (Replace Bushings)			C					F	F				
	Linkage									F				
	Clutches, Steering Levers, Seals, Bearings			C				O						
									H					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
15	Frame													
1501	Frame Assembly	O							H					
	Guard, Rock	O							O					
1503	Pintle and Towing Attachments	C							O					
16	Springs													
1601	Equalizer	F							F					
18	Body, Cab, Hood, Hull Assembly													
1801	Panel, Dash	C							H					
1801	Fenders, Hood, Panel	C							H					
1805	Floors													
	Platforms, Channels	O							F					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
1806	Upholstery Seats and Carpets													
	Cushion, Seat								O	H				
	Belts, Seat								O	O				
1808	Boxes													
	Box, Tool	O							O					
20	Hoist, Winch, Capstan, Wind Lass Power Control Unit and Pto.													
2002	Power Control Unit Ay	H	C											
	Band, Brake and Clutch			C				O	F		D			
	Case Ay, Gear	H						F	F					
	Clutch, Power Control Universal Joint Ay		C					H O	F					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
2002	Power Control Unit Ay (Cont)													
	Pulleys, Guide and Fairlead, Sprockets, Drive			C					O	F				
22	Accessory Items													
2210	Data Plates, Instruction Holders													
	Plates, Identification	O							F					
	Plates, Caution and Instruction	O							F					
43	Hydraulic System													
4302	Pumps and Pump Drive													
	Pump, Hydraulic Steering		F					O		F				

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
4309	Manual Controls													
	Levers and Linkage			C					O					
47	Gages (Nonelectrical) Weighing and Measuring Devices													
4702	Gages, Mounting, Lines, Fittings	O												
	Gage, Liquid Fuel	C							O					
4703	Hourmeter Ay	C							C					
74	Crane, Shovel or Earth Working Equipment								O					
7435	Moldboard Ay	O												
	Cutting Edges and End Bits	O							O					
									O					

SECTION II - MAINTENANCE ALLOCATION CHART

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
7436	Liftarms and Pivot Ay								O	F				
	Trunions, Push Arms, Struts			C					O	F				
76	Firefighting Equipment													
7603	Extinguisher, Fire			C					C					
	Bracket, Extinguisher	C							C					

SECTION III

MAINTENANCE ALLOCATION CHART

FOR: Tractor, Full Tracked
Caterpillar Model D6B

DATE _____

PAGE _____ OF _____

SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

REFERENCE CODE	MAINTENANCE LEVEL	NOMENCLATURE	TOOL NUMBER
		NOT REQUIRED	

SECTION IV

MAINTENANCE ALLOCATION CHART

FOR: Tractor, Full Tracked DATE

Caterpillar Model D6B PAGE OF

REFERENCE CODE	REMARKS
A-B	Test includes operational and compression
B-I	Repair of Head includes refacing
C-I	Includes metalizing and turning shaft
D-I	Repair of Flywheel includes replacing ring gear
E-I	Repair of rocker arms includes refacing
F-I	Includes build up
G-D	Include turning pins

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By Order of the Secretary of the Army:

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